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ABSTRACT

This document is designed as a guidebook for faculty and administrators of the newly-established Regional Colleges of Burma. The Regional Colleges are three-year postsecondary institutions designed to train middle level technicians to help increase the production of goods and services needed in the Burmese economy. Concentrating on the Hawaii Community College system, the author reviews the process of developing new courses, curricula, and programs in community colleges in the United States and proposes methods of adapting this process to the Regional Colleges. A detailed procedure for developing a program in Air Conditioning and Refrigeration is provided as an illustration of the process of program development. The use of program advisory committees and college faculty and administrators for program improvement are also discussed. Appendices include a sample format for new course proposals, a sample course outline, a program evaluation guide for general education areas, and descriptions of a marine pipefitter certificate program and an occupational safety program. (RT)

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ADVANCED TRAINING IN COMMUNITY COLLEGES
FOR FOUR BURMESE UNIVERSITY PROFESSORS
May - September 1977

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CURRICULUM DEVELOPMENT
IN
COMMUNITY/REGIONAL COLLEGES

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I. INTRODUCTION

1.1 Brief History of Community Colleges in the United States

Community Colleges were started in the United States in early 1900. The State of California was the pioneer of the Community College concept. The Community College concept is: (1) to help people learn what they want to learn in order to assist them in getting jobs, (2) to help them learn a skill before going to a university, or (3) to upgrade them in their jobs. The teacher's job is not to fail a student, but to help him learn the skill.

As a result of the Community College Act, passed in 1964 by the State Legislature, to establish community colleges in the State of Hawaii, five community colleges were opened in late 1966. They are:

1. Honolulu Community College, in the capitol city of Honolulu, on the island of Oahu
2. Kapiolani Community College, in Honolulu, on the island of Oahu
3. Hawaii Community College, on the island of Hawaii
4. Maui Community College, on the island of Maui
5. Kauai Community College, on the island of Kauai

These were initially technical schools under the State Department of Education. They were first transferred to the University of Hawaii System, then converted into community colleges. These community colleges were initially strong in the vocational-technical programs, and gradually, the liberal arts programs were expanded.

The first community college that was built from scratch was Leeward Community College, at Pearl City, on Oahu. It started with liberal arts programs, and gradually technical programs were added. It opened in September, 1967. The latest community college opened, was the Windward Community College. There are altogether seven community colleges under

the University of Hawaii System, which also has three university or college campuses (4 year institutions).

1.2 Functions of Community Colleges

The main functions of a community college are to offer:

1. Vocational-technical education for 2 years
2. Liberal arts transfer and general education programs
3. Community services

1.3 Pertinent Facts and Figures

For an example, let us take a look at Honolulu Community College, which is a typical community college in the United States. Some of the pertinent facts and figures are as follows:

A. Total student enrollment: 8991

B. Programs offered:

Vocational-Technical Department

1. Architectural Drafting Technology
2. Auto Body Repair and Painting
3. Automotive Mechanics Technology
4. Aviation Maintenance Technician
5. Carpentry
6. Commercial Art
7. Commercial Baking
8. Cosmetology
9. Electronics Technology
10. Engineering Technology
11. Fashion Design and Merchandising
12. Fire Science
13. Heavy Equipment Maintenance and Repair
14. Human Services
15. Industrial Education
16. Industrial Electricity
17. Machine Shop Technology
18. Occupational Safety and Health
19. Police Science
20. Refrigeration and Air Conditioning Technology
21. Sheet Metal and Plastics Technology
22. Welding Technology

Arts and Science Department

1. Humanities
2. Language Arts
3. Mathematics
4. Natural Sciences
5. Social Sciences

Special Courses and Programs

1. Apprenticeship/Journeymen Training
2. Computer Science Center
3. Cooperative Vocational Education
4. Directed Studies

Satellite Campuses

1. Kalihi-Palama Education Center
2. Hawaii State Senior Center
3. Job Experience Education
4. Pearl Harbor Naval Shipyard Apprentice School
5. Aviation Maintenance Technology at the Airport

C. Entrance and degree requirements:

Admission: "Open Door" policy is practiced at Honolulu Community College, as in other community colleges in Hawaii. That is to say, any person who is 18 years of age or older, or a high school graduate of any age, can enter a community college.

Degree:

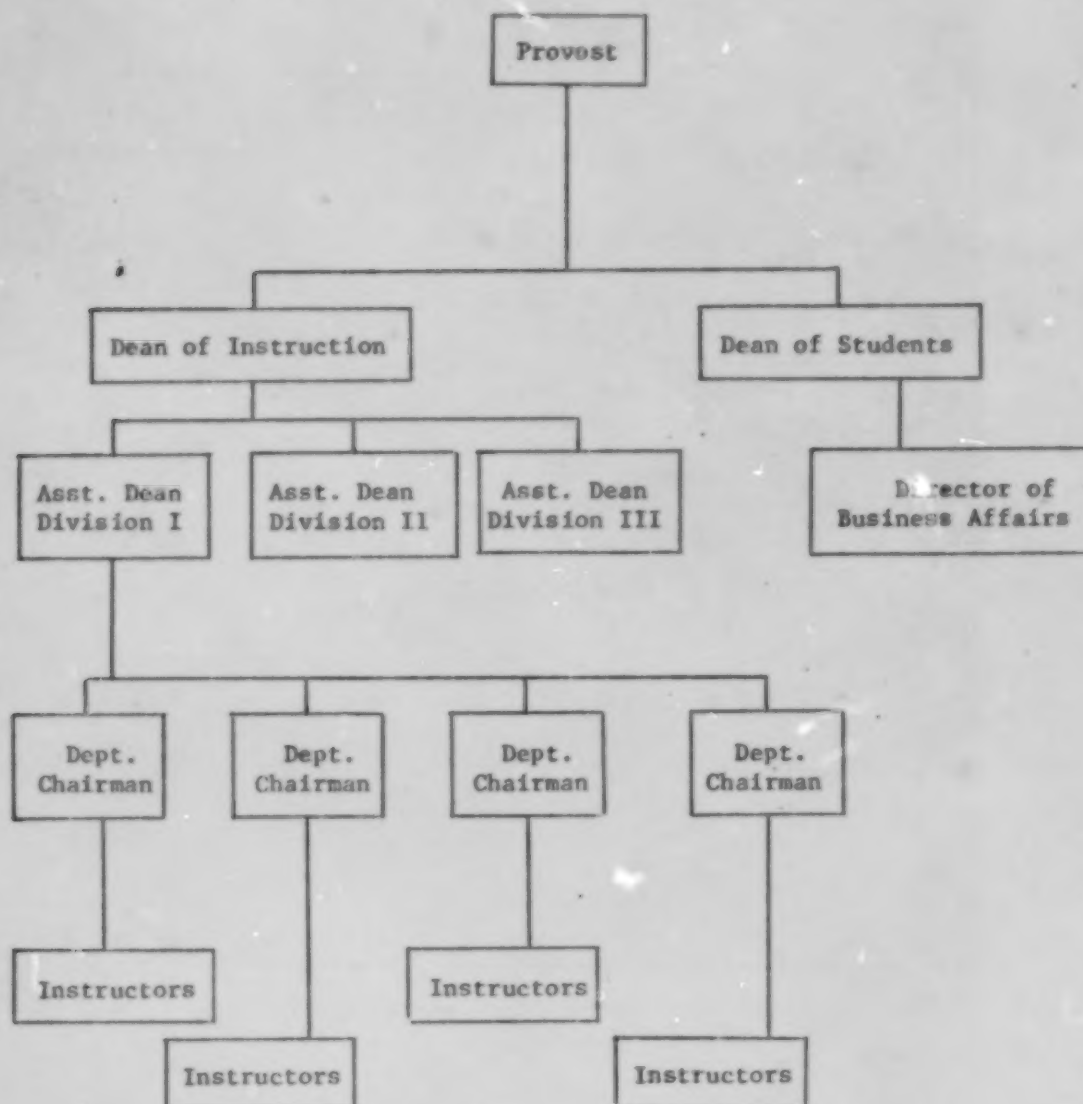
Minimum credits* required

Associate in Science Degree (A.S.)	60 credits (roughly equivalent to two academic years of classes, including 4 credits for cooperative education)
Certificate of Achievement (for a particular technology)	42 credits (= 1 1/2 years)
Associate in Arts Degree (A.A.)	60 credits
Certificate of Achievement (for Liberal Arts)	30 credits

* One credit (hour) is normally equivalent to one hour of lecture per week or three hours of practical per week.

D. Organization Chart for Administration

The following organization set-up is used:



E. Teaching Staff

Qualifications: Minimum qualifications of an instructor is as follows:

For Liberal Arts Programs

Master's Degree

For Vocational Programs

7 years experience as a skilled journeyman in the particular trade or industry

(Note: All journeymen have to pass high school and in some cases, have to finish two years of community college courses; a university degree is not necessary, but if the journeyman has it, he will start in a slightly higher salary range.)

Pay: An instructor can make from \$10,812 to \$23,938 a year (compared to a University Professor who can make \$21,468 to \$33,328 a year). If a journeyman instructor has a degree, he can make nearly the maximum range of salary (i.e. \$23,938 a year).

F. Budget and Funding

Honolulu Community College, just as the other community colleges in Hawaii, is entirely funded by the State Government. The budget allotment comes from the University of Hawaii, Community College System. For example, the budget allotted for the year 1977-78 was \$4.42 million.

1.4 Regional Colleges in Burma

A. Background

The community or regional college concept has started in Burma only about two years ago. In May, 1977, seventeen regional colleges were opened in 12 states of Burma. The basic idea was to train and produce middle level technicians who are competent enough to help increase production of goods or services needed in the Burmese economy. The need for this came out as a result of the existing

education system which keeps on producing too many university graduates who cannot find jobs and who do not have any specific skill or trade to produce goods or offer services.

B. Purpose

These regional colleges in Burma, therefore are designed to:

1. Produce middle-level technicians.
2. Train students theoretically and practically so that they will fit into industries, public and private cooperatives, etc. To fit into the latter is particularly important, because in this way, the graduates do not have to rely solely on the government for their jobs, thus partially solving the unemployment problem.
3. Engage students in production while studying in their various technologies.

C. Entrance and Graduation Requirements

The entrance requirement for a student to a regional college is that he (or she) must pass the Matriculation (high school) Examination which was centrally administered throughout the country. In fact, all the matriculated students must go to a regional college for two years before the student can sit for an entrance examination held by the University or Institute where the student wishes to enter.

After two years at the Regional College, the student can receive a diploma in a particular technology. The student then can go to the university if he passes the entrance exam; if the student fails, then he goes back to the Regional College for a year of on-the-job training. After completion of this training, a certificate of proficiency will be awarded.

D. Enrollment and Programs Offered

The present total enrollment at the 17 regional colleges throughout the country is about 12,000 students. Altogether, 23 technologies (or programs) are offered throughout the 17 regional colleges, although, of course, all the technologies cannot be offered at any one regional college. The 23 technologies being offered are:

1. Textile Technology
2. Chemical Technology
3. Mining and Petroleum Production Technology
4. Metal Working Technology
5. Wood Working Technology
6. Machinery Repair and Maintenance Technology
7. Electrical Repair and Maintenance Technology
8. Building Construction and Maintenance Technology
9. Industrial Arts and Crafts Technology
10. Agriculture Technology
11. Agricultural Products Technology
12. Aquaculture and Marine Products Technology
13. Animal Husbandry and Products Technology
14. Forest Products Technology
15. Rubber Technology
16. Food Technology
17. Oil and Fats Technology
18. Accounting
19. Secretarial Science
20. Mass Communications Technology
21. Movie Making Technology
22. Printing and Publication Technology
23. Home Economics

II. DEVELOPING A NEW PROGRAM IN A COMMUNITY COLLEGE IN THE UNITED STATES

2.1 How a New Program Starts

A new program may be started in either of the following two ways:

1. Internally - The new program being proposed by a faculty member, or by a Department Chairman.
2. Externally - The new program being proposed by the industry people (labor unions or management), or by the community.

Either way, the important criterion is that there must be a real need for the program, without which, the program cannot be successful.

2.2 Guidelines and Procedures for Developing a New Program

Regardless of the way a program got started, the following steps are basically involved in developing a new program:

Step 1

The first step is to form an Advisory Committee on Programs and Curricula. The Committee would generally consist of the following members:

1. Dean of Instruction or Assistant Dean of Instruction as chairman of the committee.
2. Faculty member or Department Chairman in the proposed discipline as the secretary.
3. Two members from the industry (one from management, and one from labor union).
4. Two more members from the industry, (but a different company from the first one).
5. One member from the community, or small private enterprise or business.
6. Mathematics Department Chairman
7. Science Department Chairman
8. English Department Chairman

Step 2

The committee meets to consider in broad terms objectives, needs, curriculum, staffing, equipment, credit hours, etc., concerning the new program and makes a general decision concerning these areas.

Step 3

The committee then assigns the experienced faculty member to develop the curriculum in detail and write it up. The faculty member chosen is usually an educator-trainer who has experience in developing and writing up curriculums, courses, units of instruction, etc. He will, in developing the curriculum, work closely with an expert (or two or more as the need arises) from the industry who is experienced and knows the specific tasks and jobs involved in that particular trade for which the program was to be developed.

In developing the curriculum, the following is a general procedure to follow:

- i Do job and task analyses of the particular trade involved. (Explained later in Chapter 3, sec. 3.2)
- ii Consider the degree of importance of each task and select the jobs to be included in the program.
- iii Write the units of instruction. (See sec. 3.2)
- iv Group units of instruction into courses; decide on theory and laboratory hours.
- v Write course outlines. (See Chapter IV, Section 4.4 for further information.)

Step 4

A draft of a proposal for the new program is then written up and it is put up for comments and consideration by the Advisory Committee members at the next meeting.

In writing the proposal, the following guidelines and format are used:

GUIDELINES FOR CERTIFICATE AND DEGREE PROPOSALS

- I. Background - a short statement on how the program first gets started.
- II. Introduction
 - A. Name of College
 - B. Name of program, date of proposal implementation
 - C. Brief summary of proposal

III. Objectives and Need for Program

- A. Objectives - occupation for which the program will provide training; specific skills to be taught.
- B. Need - manpower projections, special study, or other authoritative data indicating need for trained persons in this field.
- C. Target Group - anticipated enrollment. Is there student demand for training? Will any special groups be served (retarded, handicapped, etc.) other than the majors and non-majors?

IV. Description of the Program

- A. Curriculum - Required and recommended courses. Specify total number of credit hours required to earn certificate or degree.
- B. Course Content - Provide brief course description for each required course, indicating the specific skills which are to be taught.
- C. Methods of Instruction - Specify lecture, discussion, practical demonstration, field trips, etc.
- D. Examinations - Specify performance, written, oral.

V. Measures of Program Effectiveness

- 1. Anticipated average time for program completion, number of students to complete program annually.
- 2. Percentage goals for placement of graduates and for graduates passing any required professional examinations.
- 3. Methods of faculty evaluation.

VI. Resource Requirements

- 1. Courses listed in III above which are not currently offered by the college.
- 2. Additional staff required. Are funds available? Qualifications required. Are qualified people available? If no additional staff are required, indicate qualification's and utilization of existing staff.
- 3. Additional facilities or equipment required. Is funding available? If none required, how will existing facilities and equipment be utilized?

4. Faculty work assignment guidelines: anticipated minimum and average class size, student/faculty ratios, and weekly instructional contact hours.

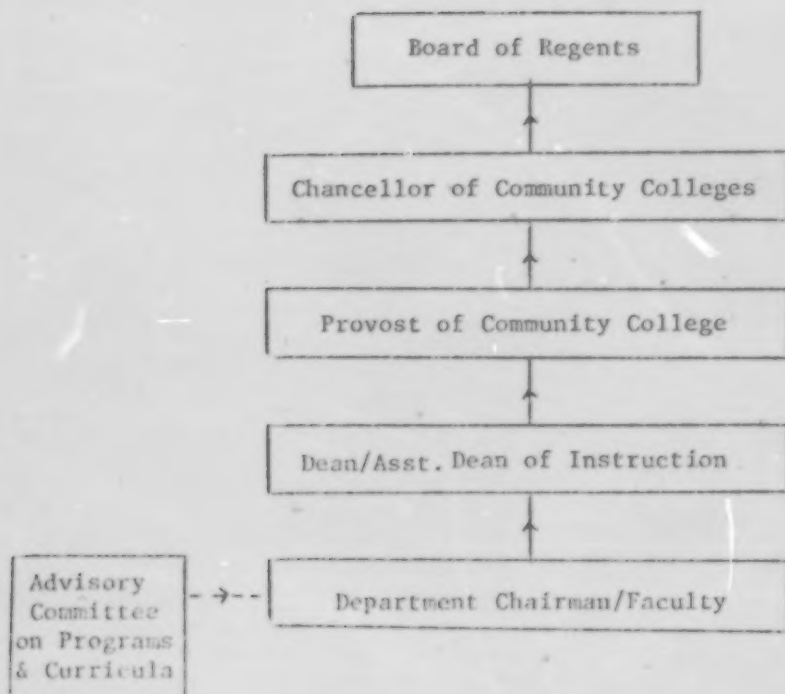
Step 5

After making the suggested corrections or additions, a final draft of the proposal is written and the approval of the Advisory Committee is obtained.

Step 6

The proposal for the new technology is then sent to the Provost of the Community College. With his approval, it is forwarded to the Chancellor of the Community Colleges and then, if necessary, to the Board of Regents, as shown in the chart below.

PROGRAM APPROVAL STEPS



2.3 Illustration of a New Program Proposal

In order to grasp the details of the techniques of developing a new curriculum or program it will be helpful to take a close look at a typical example of a new program proposal in a community college in the United States. For this purpose, a proposal for the "Certificate of Achievement" program for Marine Pipe Fitter at Pearl Harbor Naval Shipyard is given in the Appendix A-1.

III. DEVELOPING A NEW CURRICULUM OR TECHNOLOGY FOR REGIONAL COLLEGES IN BURMA

3.1 Comparison of Regional Colleges and Community Colleges

A brief background and purpose of establishing regional colleges in Burma was already given in section 1.4 of Chapter I. Perhaps it can be seen that regional colleges in Burma are similar to community colleges in the United States, but in reality, there are some significant difference. Some of them are pointed out below:

1. The community colleges use "credit hour" and "semester" system, while the regional colleges employ a system where the students are required to take, for a certain technology, a fixed set of courses in the first year and another fixed set of courses for the second year.
2. After two years of community college, students can earn their A.S. degrees and can enter the University to work for their Bachelor's degrees. On the other hand, after two years of regional college, students can get a Diploma but they must still take an entrance examination held by the University and pass it in order to be accepted by the University. This is not an easy task since the University, in general, will accept only a small percentage (not more than 20%, maybe) of the graduates of the regional colleges.
3. Cooperative Education training is not compulsory for all students in the community colleges. Furthermore, it is only part of the second half of the second year program. (4 credit hours only are specified for Co-op out of 15 credit hours for the semester which lasts about 4 months.)

On the other hand, in the regional colleges, all the students who have finished the second year and who are not accepted by the University must take, in their third year at regional college, an "on-the-job" training for a full academic year by working at factories or workshops or in pilot plants at the Regional College.

3.2 Guidelines and Procedures for Curriculum Development

Having known the current practices of the Burmese Regional Colleges, it will be easier to adapt the guidelines and procedures stated in Chapter II for the community colleges, to the Regional Colleges. The following guidelines and procedures are recommended for developing a new curriculum or technology in Burmese Regional Colleges.

Step 1

Form a Curriculum or Syllabus Advisory Committee. The committee should be composed of the following members:

1. 2 representatives of the regional college (1 administrator and 1 faculty member).
2. 4 members from industry (2 from supervisory level and 2 from foremen/technician ranks; preferably 2 each from 2 different factories).
3. 1 member from Rangoon Institute of Technology (University).
4. 1 member from the Government Technical Institute.
5. 1 member from a Technical High School.

Step 2

The committee in their first two meetings consider and decide in general terms on the objectives, needs, curriculum and courses, staffing, equipments, costs and financing, etc.

Step 3

The committee assigns the experienced faculty member the responsibility to develop the curriculum in detail and write it up. The faculty member chosen should have had years of experience in teaching related courses and developing new programs. He will, in developing the curriculum for this case, work closely with experts from the industry (maybe the same ones from industry who are in the Curriculum Advisory Committee) who are familiar with the specific tasks and jobs involved in that particular trade for which the technology was being developed.

In developing the curriculum, the following procedure may be followed:

1. Do job analysis and task analysis of the particular trade involved.

Job analysis is defined as a detailed listing of duties, operations and skills necessary to perform a clearly defined, specific job, organized into logical sequence which may be used for teaching, employment or classification purposes.¹

¹C. V. Good, Dictionary of Education (New York, McGraw-Hill, 1973), p. 30.

Task analysis involves breaking down the components of the tasks to be performed and stating the skills required in order to do those tasks. Task analysis is more precisely defined as the reduction of the components of a task to its basic behavioral elements, usually for purposes of determining the best methods of training, but also to understand better the learning process.²

2. Write units of instruction.

To do this, the curriculum planner together with the industry expert(s) first decide which of the jobs listed above are important, select the important ones and relist them as headings of units of instruction. Under each heading, the related subject matter to be taught is listed in order for the students to learn the skills needed to do the job.

3. Group units of instruction into courses; decide on theory and laboratory hours.

Perhaps two or three or more units of instruction which are closely related may be grouped into one course, etc.

4. Write course outlines.

A course outline is a formal and systematic presentation of what the course is about and what the students are going to learn in it. (See also Chapter 4, sec. 4.4)

The following page shows one type of format that could be used in writing up a course outline.

Step 4

A draft of the proposal for the new technology is written up and it is put up in the next meeting of the Curriculum Advisory Committee for comments and suggestions.

In writing up the proposal, follow the format and guidelines given in section 2.2, step 4.

Step 5

After making the suggested corrections and modifications, a final draft of the proposal is written and the approval of the Advisory Committee is obtained.

²Ibid., p. 31.

NAME OF REGIONAL COLLEGE
NAME OF STATE/DIVISION
Course Outline

COURSE TITLE:

COURSE NUMBER:

HOURS PER WEEK:

(Lecture)

(Tutorial)

(Lab)

MAJOR:

YEAR:

DEPARTMENT:

- A. COURSE DESCRIPTION: (See the example which follows in Section 3.3)
- B. COURSE OBJECTIVES: (See Section 3.3)
1. General
 2. Specific
- C. COURSE CONTENT (SYLLABUS): (See Section 3.3)
- D. TEXT AND REFERENCES:
1. Text(s):
Author; Title; Publisher; Place; Year
 2. Reference(s):
Author; Title; Publisher; Place; Year
- E. EQUIPMENT AND MATERIALS:
1. Classroom:
 2. Laboratory:
- F. METHODS OF INSTRUCTION:
Lecture; Discussion; Laboratory Demonstration and Practice; Field Trips, etc.
- G. METHODS OF EVALUATION:
Specify whether written exam; skill test, oral exam
State weightage of each test

Step 6

The proposal for the new technology is then sent up to the Principal of the regional college, and then up the ladder to the higher authorities concerned for finalization of the approval. This is explained in details in Section 3.5 later.

3.3 Illustration of Developing Curriculum for a New Technology

Suppose it is required to develop a curriculum for a new technology to be offered in a regional college. Let us choose, as a typical illustration, a new technology which is not yet offered in the present regional colleges in Burma, and which is vocational-technical in nature. One such technology is the "Refrigeration and Air Conditioning Technology". The first thing to do is to recruit the teaching staff. At least one qualified lecturer with industry and/or teaching experience who can teach courses in refrigeration and air conditioning and who can demonstrate in the laboratory as well should be hired, before proceeding any further.

Now, according to the guidelines outlined above, the steps to be taken are:

Step 1

Form a Refrigeration and Air Conditioning Curriculum Advisory Committee. The following members should be included:

1. Principal of the regional college, ... as president
2. Head of Department or Asst. Lecturer, Refrigeration and Air Conditioning Department, ... as secretary
3. Engineer/Manager, People's Electro-Mechanical Services, (PEMS), ... as member
4. Foreman/Senior Technician, PEMS, ... as member
5. Assistant Lecturer/Lecturer, Rangoon Institute of Technology, Mechanical Engineering Department, ... as member
6. Head, Department of Electrical Maintenance and Repair Technology, ... as member

7. Head, Department of Metal Working Technology, ... as member
8. Lecturer, Electrical Power Department, Government Technical Institute, Insein, ... as member
9. Lecturer, Government Technical Institute, Natmank, ... as member
10. Engineer/Manager, from Heavy Industry, Refrigerator and Air Conditioner Division, Kaba Aye, Rangoon, ... as member
11. Manager, Trade Corporation (13), Rangoon, ... as member

Step 2

The first thing to do after forming the Curriculum Advisory Committee is for the members to sit down together and consider, discuss, and decide in general terms on the objectives, needs, curriculum and courses, staffing, equipments, costs and financing, etc., concerning this new technology. It may take more than one meeting to do this.

Step 3

The committee assigns the faculty member from the Refrigeration and Air Conditioning Department to do the details, i.e., he is given the responsibility to develop the curriculum in detail and write it up for proposal. He can call on any member of the Advisory Committee for their expertise, or he can approach other experts in this field in the industry who are not members of the committee. For the job and task analyses, he can ask for the advice of people from PEMS, for example.

The following sub-steps are carried out in developing the curriculum, as outlined in section 3.2.

Sub-Step 1: Do job and task analyses of the Refrigeration and Air Conditioning Technician. The final results may be as given below:

Definition: The air conditioning and refrigeration mechanic installs, maintains and repairs equipment and accessory units used for conditioning air and cooling water on customers' premises.⁴

According to the above definition, a refrigeration and air conditioning service technician should have the knowledge of the skill in:

W. E. Hopke, The Encyclopedia of Careers and Vocational Guidance (1975), II, p. 570.

Refrigeration

1. How a refrigeration system works and the principles involved.
2. Components of the refrigeration system: compressor, condenser, evaporator, etc.
3. Control systems of the refrigeration unit.
4. Installation of refrigeration systems.
5. Maintenance of refrigeration systems.
6. Repair and servicing of refrigeration systems.
7. Trouble-shooting of refrigeration systems.

Air Conditioning

1. How an air conditioning system works and the principles involved.
2. Psychrometry and properties of air; human comfort.
3. Air conditioning equipment; comfort unit coolers, chilled water coolers, dehumidifier, air distribution equipment, etc.
4. Air conditioning control systems.
5. Installation of air conditioning systems.
6. Maintenance of air conditioning systems.
7. Repair and servicing of air conditioners.
8. Trouble-shooting of air conditioning systems.

Electricals

1. Rewinding and repairs of compressor motors, fan motors, etc.
2. Electrical repairs in refrigeration control systems.
3. Electrical repairs in air conditioning control systems.

General

- (a) Welding
 1. Gas welding and arc welding techniques
 2. Brazing and Silver soldering
 3. Oxy-acetylene cutting

- (b) Duct Fabrication
 - 1. Geometrical drawing
 - 2. Fabrication of air conditioning ductworks
 - 3. Fabrication of basic fittings and transitions
- (c) Management
 - 1. Elements of small business management
 - 2. Budgeting and accounting
 - 3. Quality control
 - 4. Auditing

Sub-Step 2: Write units of instruction. The results might be as follows:

Refrigeration and Air Conditioning Technology
Units of Instruction

- I. The Industry
 - 1. Applications of Refrigeration and Air Conditioning
 - 2. Refrigeration and Air Conditioning Industries in Burma
 - 3. Employment opportunities and projections
- II. Servicing of Refrigeration Systems
 - 1. Basic refrigeration cycles
 - 2. Vapour compression refrigeration system
 - 3. Refrigerants
 - 4. Refrigeration equipment
- III. Refrigeration Repair Tools and Their Usage
 - 1. Tube flaring and bending tools
 - 2. Service manifold and compound gage
 - 3. Leakage testing; refrigerant charging
 - 4. Refrigeration system; installation work
 - 5. Repair of refrigeration system components
- IV. Refrigeration System Controls and Electrical Circuits
 - 1. Control devices
 - 2. Automatic expansion valves
 - 3. Thermostats; solenoid valves; HP and LP cut-outs
 - 4. Electrical circuits of control system.
- V. Electrical Repairs
 - 1. Compressor motor types and disassembly
 - 2. Rewinding of motors
 - 3. Trouble-shooting of refrigeration electrical circuits
 - 4. Repair of relays, thermostats, solenoid coils, etc.
- VI. Basic Air Conditioning Principles
 - 1. Principle of air conditioning systems
 - 2. Psychometry and properties of air
 - 3. Human comfort and effective temperature

- VII. Air Conditioning Equipments
 - 1. Comfort unit coolers; residential systems
 - 2. Chilled water systems
 - 3. Dehumidifiers
 - 4. Air distribution equipment
- VIII. Electrical Repairs of Air Conditioning Systems
 - 1. Fan motor types and disassembly
 - 2. Thermostats and humidistats
 - 3. Electrical circuits of control devices
 - 4. Relays; overloads and line starters
 - 5. Trouble-shooting and repairs of air conditioners
- IX. Welding
 - 1. Basic oxy-acetylene welding
 - 2. Safety
 - 3. Arc welding of ferrous metals
 - 4. Brazing and silver soldering of ferrous and non-ferrous metals
- X. Duct Fabrication
 - 1. Fabricating air conditioning and ventilation ductworks
 - 2. Geometrical drawing
 - 3. Fabrication of basic fittings such as elbows, branches, etc.
 - 4. Pattern development for various types of transitions
- XI. Elements of Business Management
 - 1. Starting a business enterprise
 - 2. Smooth running of the enterprise
 - 3. Budgeting; accounting
 - 4. Labor and personnel management
 - 5. Quality control
 - 6. Selling the products
 - 7. Evaluation and auditing
 - 8. Expansion of business
 - 9. Model business enterprise

Sub-Step 3: Combine units of instruction into courses, at the same time, dividing each course into theory and laboratory hours appropriately. The results obtained may be as follows:

Units of Instruction I, II, and III are combined into RAC 201

RAC 201 THEORY AND SERVICING OF REFRIGERATION SYSTEMS (2 hours theory, 6 hours lab)

- 1. Introduction; refrigeration and air conditioning industries in Burma; employment opportunities
- 2. Fundamental principles of refrigeration and basic cycles
- 3. Vapor-compression refrigeration system

4. Refrigeration equipments
5. Repair tools and their usage
6. Hand tools: tube bending and flaring tools
7. Servicing instruments: compound gauge, service manifolds, vacuum pumps
8. Leakage testing
9. Refrigerant charging
10. Repair of refrigeration system components: compressors, condensers, evaporators, etc.
11. Installation work: plumbing and electrical wiring, checking system

Units of Instruction III and IV are combined into RAC 202

RAC 202 REFRIGERATION SYSTEM CONTROLS AND ELECTRICAL CIRCUITS (2 hours theory, 6 hours lab)

1. Control devices, manual and automatic
2. Automatic expansion valves
3. Thermostats, solenoid valves, low-pressure and high-pressure cut-outs
4. Electrical circuits of the control system
5. Compressor motor types and disassembly
6. Rewinding and repairs of motors
7. Trouble-shooting of refrigeration electrical circuits
8. Repair of relays, thermostats, HP and LP cut-outs, etc.

Units of Instruction VI, VII and VIII are combined into RAC 203

RAC 203 THEORY AND SERVICING OF AIR CONDITIONING SYSTEMS (2 hours theory, 3 hours lab)

1. Basic air conditioning systems
2. Psychrometry and properties of air
3. Human comfort and effective temperature

4. Air conditioning equipment
5. System control devices
6. Air distribution systems
7. Electrical circuits and repair of control devices of air conditioning systems
8. Electrical repairs of fan motors, damper motors, humidistats, thermostats, relays, overloads, line starters, etc.
9. Trouble-shooting and repair of air conditioning systems
10. Maintenance of air conditioning equipment
11. Installation of air conditioning equipment and checking them

Unit of Instruction IX gives RAC 204

RAC 204 WELDING (1 hour theory, 2 hours lab)

1. Basic oxy-acetylene welding
2. Safe operation of welding equipments
3. Arc welding of ferrous metals
4. Brazing and silver soldering
5. Oxy-acetylene cutting

Unit of Instruction X gives RAC 205

RAC 205 DUCT FABRICATION (1 hour theory, 2 hours lab)

1. Geometrical drawing
2. Fabrication of air conditioning and ventilation ductworks
3. Fabrication of basic fittings such as elbows, branches, etc.
4. Pattern developments for various types of transitions

Unit of Instruction XI gives BUS 201

BUS 201 ELEMENTS OF BUSINESS MANAGEMENT (2 hours theory, 1 hour tutorial)

1. Initial considerations for starting a business enterprise
2. Actual implementation of the enterprise

3. Smooth running of the enterprise
4. Budgeting, accounting
5. Labor and personnel management
6. Quality control
7. Selling the products
8. Evaluation and auditing
9. Progress and expansion of business
10. Illustration of a model business enterprise

Sub-step 4: Write course outlines, following the format and guidelines given earlier. The result may be as follows, sample course outline for RAC 201:

HLAING COMMUNITY COLLEGE

RANGOON DIVISION

Course Outline

Course title: Theory and Servicing of Refrigeration Systems

Course Number: RAC 201

Hours per week:	<u>2</u>	<u>0</u>	<u>6</u>
	Lecture	Tutorial	Lab

Major: Refrigeration and Air Conditioning Technology

Year: 2nd

Department: Refrigeration and Air Conditioning

A. Course Description - Fundamental principles of refrigeration. Common refrigerants used. Refrigeration equipment. Practical usage of basic hand tools, special tools and instruments for servicing of refrigeration systems. Trouble-shooting and mechanical repairs of refrigeration systems.

B. Course Objectives

1. General - At the end of the course, the student will be able to understand, diagnose and do mechanical repairs of refrigeration equipment.

2. Specific - At the end of the course, the student will be able to:

- a) Explain various types of refrigeration systems
- b) Explain types of equipment used in a refrigeration system
- c) Talk on commonly used refrigerants and explain the advantages and disadvantages of one refrigerant over another
- d) Demonstrate his knowledge of different methods of refrigerant charging
- e) Explain how to detect refrigerant leakage
- f) Do fault-tracing on a refrigeration system which is not working
- g) Do mechanical repairs of components of a refrigeration system

C. Course Content

- 1. Introduction - Commercial and industrial application of air conditioning and refrigeration; refrigeration and air conditioning industries in Burma; employment opportunities
- 2. Fundamental principles and basic cycles - Basic principles of refrigeration; brief descriptions of various types of refrigeration cycles; vapour-compression refrigeration cycle; air cycle refrigeration; steam-jet refrigeration; absorption refrigeration
- 3. Vapour-compression refrigeration system - Detailed study of vapour-compression refrigeration; domestic refrigeration system; introduction to commercial refrigeration systems
- 4. Refrigeration equipment - Types and construction of compressors, condensers, receivers, evaporators, expansion valves, solenoid valves, defrost systems, safety devices
- 5. Refrigerants - Study of common refrigerants used, properties and performances of Freon-12, Freon-22, Ammonia, CO₂, etc. compared
- 6. Use and handling of repair tools - Tube flaring tool and proper way to use it. Bending of pipes, and use of pipe wrench in plumbing work.

7. Special refrigeration servicing tools & instruments - Use operation and handling of service manifolds, compound pressure gauge, vacuum pump, etc.
8. Leakage testing - How to observe refrigerant leakage in a refrigeration system, testing with propane leak detector.
9. Refrigerant charging - Proper methods of charging a refrigeration system, low-side charging, high-side charging, determination of the weight of refrigerant charged.
10. Repair of refrigeration system components - Testing, fault-tracing and repairing of compressors, repair of condensers, repair of evaporators, repair and adjusting of expansion valves and thermostats.
11. Installation of refrigeration systems, plumbing and piping work, electrical wiring, testing and inspection of the system.

D. Text and References

1. Text

- a) Trane: "Trane Reciprocating Refrigeration Manual,"
Trane
- b) Kamm: "Refrigeration and Air Conditioning Manual,"
Brodhead-Garrett

2. References

- Dwiggins: "Automotive Air Conditioning," Brodhead-Garrett

3. Handouts

Work Manual prepared by the instructor

E. Equipments and Materials

1. Classroom - Blackboard, chalk, duster, examples of refrigeration servicing instruments and tools for demonstration in classroom.
2. Laboratory - For equipment in the laboratory, see "Resource Requirements" in sec. 3.4 which follows.

F. Methods of Instruction

1. Lecture and discussion in classroom
2. Practical demonstration in laboratory
3. Actual operation and handling of instruments, tools, equipments and machines by individual students or in small groups

G. Methods of Evaluation

1. Theory (35%) - Written examinations (half-yearly and final)
2. Practical (65%) - Practical skill or performance test, oral exam (viva voce)

Similarly, course outlines can be written for RAC 202, RAC 203, RAC 204 and RAC 205

Step 4

Write up a draft of the proposal for the Refrigeration and Air Conditioning Technology. The draft is put up for discussion at the meeting of the Refrigeration and Air Conditioning Curriculum Advisory Committee.

Step 5

After making the suggested corrections and modifications, a final draft of the proposal is written and the approval of the Advisory Committee is obtained. The final draft of the proposal is illustrated in the next section 3.4.

3.4 Writing Up a Proposal for the New Technology

The final draft of the proposal for the Refrigeration and Air Conditioning Technology is given below:

I. Background

In Burma, there is as yet no institution, either government or private, which produces formally trained service technicians in the field of Refrigeration and Air Conditioning. Yet, there are many household refrigerators and room air conditioners throughout the country, and there are quite a few industries such as

textile mills, paper factories and cigarette factories, which use air conditioning and refrigeration equipment for environmental control of their products, machines and equipment. Moreover, the government enterprise such as the P.E.M.S. (Peoples' Electro-Mechanical Services) undertakes the repair of refrigerators and air conditioners. Therefore, the need for refrigeration and air conditioning service technicians arises. As a trial, this Refrigeration and Air Conditioning Technology is proposed to be offered at Hlaing Community College in Rangoon, which, being the capital city, has more people and factories and therefore more demands for the technicians.

II. Introduction

Based on the background information provided, Hlaing Regional College in Rangoon Division plans to initiate a Certificate of Proficiency program in Refrigeration and Air Conditioning Technology in the First Term of 1979 to meet the future needs of Refrigeration and Air Conditioning Technicians in the country.

The anticipated result of implementation of this program would be 25 trained Refrigeration and Air Conditioning Service technicians within two years of starting the program. Assuming 10% of these entered the Rangoon Institute of Technology or the University, 90% of them would undergo one more year of on-the-job training in the industries to further practice and develop their skills. The proposal and training will be evaluated for the long term needs and for developing the same or similar programs at other Regional Colleges throughout the country in future.

III. Objectives and Need for Program

- A. Objectives - The objective of this program is to provide necessary instruction and required on-the-job training to produce Refrigeration and Air Conditioning Service Technicians who will have the skill to do mechanical as well as electrical repairs and maintenance and installation of refrigeration and air conditioning equipments. These technicians will be trained to serve the refrigeration and air conditioning maintenance needs of the Government enterprises naval and state ships, or to establish their own Refrigeration and Air Service and Repair Cooperatives, or to establish their own individual repair and service shops, or to serve as an assistant to the engineer in installation of central air conditioning systems in homes or industries.
- B. Need - As stated in the background of this proposal, the need for trained refrigeration and air conditioning service technicians can be justified by the fact that there are many industries which use refrigeration and air conditioning equipment, and that there are more privately owned room, office, and residential air conditioners, domestic refrigerators and freezers. There is no statistical data available, and no manpower surveys and projections in this field at present. But, an estimation can be given from experience combined with consultation with the knowledgeable persons who are involved in this field.

The following are the industries which use refrigeration and air conditioning equipment extensively:

1. People's Pearl and Fishery Board, Rangoon
2. People's Textile Mill, Thamaing
3. People's Textile Mill, Sagaing
4. People's Textile Mill, Meiktila
5. People's Textile Mill, Pleik, Mandalay
6. Paper Mill, Sittang
7. People's Cigarette Factory No. 1, Rangoon
8. People's Cigarette Factory No. 2, Rangoon
9. Heavy Industries, Kaba Aye, Rangoon
10. Defence Services Hospital, Mingaladon, Rangoon
11. Inya Lake Hotel, Rangoon
12. Mingaladon Airport, Rangoon
13. Dagon Ice and Soft Drinks Factory, Rangoon
14. Diamond Ice and Soft Drinks Factory, Rangoon
15. People's Ice Factory, Mandalay

These factories, hotels and offices will certainly need refrigeration and air conditioning service technicians.

There is also Peoples' Electro-Mechanical Services which undertakes the repair and servicing of refrigerators and air conditioners. They are in need of trained refrigeration and air conditioning technicians.

The Heavy Industry (1) in Rangoon assembles and produces National Air Conditioners and National Refrigerators, so trained refrigeration and air conditioning technicians are needed there too.

In addition, there are thousands of room air conditioners, domestic refrigerators and food freezers which will need the services of refrigeration and air conditioning technicians.

C. Target Group - Since this is a new field and the fact that a course of this type has never been offered in any of

technical high schools or Government technical institutes throughout the country, it can certainly be predicted that there will be a significant number of students who will be willing to study this technology. It is estimated that about 200 students may apply for this technology. It may be possible that some students who are taking the Electrical Repair and Maintenance Technology can transfer, if they wish, to take Refrigeration and Air Conditioning Technology.

IV. Description of the Program

A. Curriculum - The complete curriculum for the Refrigeration and Air Conditioning Technology requires two years of taking courses at the Community College, and a full year of on-the-job training in the third year.

To earn a Certificate of Proficiency in the Refrigeration and Air Conditioning Technology, a student must complete successfully six courses in the first year, six more courses in the second year as shown below, and on-the-job training in the third year.

To earn a Diploma in the Refrigeration and Air Conditioning Technology, a student need to complete successfully the first two years of courses at the Regional College.

REFRIGERATION AND AIR CONDITIONING TECHNOLOGY

First Year

Common courses for Science Combination with Mathematics

		Theory (hrs./wk.)	Tutorial (hrs./wk.)	Lab (hrs./wk.)
ENG 101	English :	4	1	0
BUR 101	Burmese	2	1	0
PH 101	Physics	2	0	2
CH 101	Chemistry	4	0	2
PS 101	Political Science	3	0	0
MATH 101	Mathematics	4	2	0
Total = 27 hours =		19	4	4

Second Year

		Theory (hrs./wk.)	Tutorial (hrs./wk.)	Lab (hrs./wk.)
RAC 201	Theory & Servicing of Refrigeration Systems	2	0	6
RAC 202	Refrigeration System Controls & Electrical Circuits	2	0	6
RAC 203	Theory and Servicing of Air Conditioning Systems	2	0	3
RAC 204	Welding	1	0	2
RAC 205	Duct Fabrication	1	0	2
BUS 201	Elements of Business Management	2	1	0
Total = 30 hours =		10	1	19

Third Year*

		Theory (hrs./wk.)	Tutorial (hrs./wk.)	Lab (hrs./wk.)
RAC 206	On-the-Job Training	0	0	44

*The third year On-the-Job training is only for those who do not pass the entrance examination to a University or Institute of their choice, and for those who do not wish to go to a University but rather have a Certificate of Proficiency.

B. Course Descriptions

ENG 101 English (4-1-0)

Comprehension: Independent reading of articles selected; testing of students' ability to comprehend by different methods.

Vocabulary: The study of some words and phrases and their usages.

Morphology: The study of some words (taken from selections prescribed) and their various forms.

Structure: The study of patterns of sentences.

Composition: Paragraph writing; letter-writing (formal and informal); technical writing; summarizing; sentence construction with given words and phrases.

BUR 101 Burmese (2-1-0)

Study of Burmese phrases in different forms. Study of Burmese poems; appreciation of poems.

Writing practice: essays; official writings; translation of technical papers into Burmese.

PH 101 Physics (2-0-2)

Mechanics and hydrostatics; work and power machines; pressure of liquids.

Heat: Measurement of heat; temperature; expansion of liquids and solids; gas laws; expansion of gases; latent heat.

Light: Reflection and refraction of light; lens.

Electricity and magnetism: magnets and magnetic fields; electric current and resistance; electrical power; electric motor; electrical machines used in industry for production.

CH 101 Chemistry (4-0-2)

Inorganic chemistry; properties of copper, silver, gold, zinc, iron, cobalt, nickel. Organic chemistry; hydrocarbon; alcohol; ether. Physical chemistry; salts; gas productions; salt production.

MATH 101 Mathematics (4-2-0)

Numbers; functions; coordinate geometry; trigonometric functions; calculus; differentiation.

PS 101 Political Science (3-0-0)

Burma Socialist Program Party; history of Burma's struggle for freedom and independence.

RAC 201 Theory and Servicing of Refrigeration Systems (2-0-6)

Introduction - Refrigeration and Air Conditioning industries; employment opportunities. Fundamental principles of refrigeration and basic cycles. Vapor-compression refrigeration system. Refrigeration equipments. Refrigerants. Repair tools and their usage. Hand tools, tube flaring and bending tools. Use of servicing instruments; compound gage; service manifolds; vacuum pumps. Leakage testing. Refrigerant charging. Trouble-shooting and repair of refrigeration system components. Installation of refrigeration systems and checking.

RAC 202 Refrigeration System Controls and Electrical Circuits (2-0-6)

Refrigeration control devices, manual and automatic. Thermostat. Solenoid valves. High-pressure and low-pressure cut-outs. Electrical circuits and controls. Compressor motor types. Repair and rewinding of the motors. Trouble-shooting of electrical systems. Testing and repair of thermostat, LP and HP cut-outs, relays, overloads, solenoids and line starter switches.

RAC 203 Theory and Servicing of Air Conditioning Systems (2-0-3)

Basic Air Conditioning systems. Psychrometry and properties of air. Human comfort and effective temperature. Air conditioning equipments. System control devices. Air distribution systems. Electrical circuits and control devices of air conditioning systems. Electrical repairs of fan motors, damper motors, humidistats, etc. Trouble-shooting and repair of air conditioning systems. Maintenance of air conditioning equipments. Installation of air conditioning equipments and checking them.

RAC 204 Welding (1-0-2)

Basic oxy-acetylene welding. Safe operation of welding equipments. Arc welding of ferrous metals. Brazing and silver soldering of ferrous and non-ferrous metals. Oxy-acetylene cutting.

RAC 205 Duct Fabrication (1-0-2)

Geometrical drawing. Fabrication of air conditioning and ventilation ductworks. Fabrication of basic fittings such as elbows, branches, etc. Pattern developments for various types of transitions.

BUS 201 Elements of Business Management (2-1-0)

Initial considerations for starting a business enterprise. Actual implementation of the enterprise. Smooth running of the enterprise. Budgeting; accounting. Labor and personnel management. Quality control; selling the products. Evaluation and auditing. Progress and expansion of business. Illustration of a model business enterprise.

RAC 206 On-the-Job Training (0-0-44)

Training on-the-job as a paid or unpaid full-time worker/apprentice in the related industries, or in the pilot plants set up by the Regional College, for a full year.

C. Methods of Instruction - The maximum class size for each of the projected new courses will be 30 students. There will be 3 or 4 modes of instruction as follows:

- i lecture in classroom
- ii student participation and discussion in tutorial class
- iii practical demonstration in the laboratory
- iv actual operation and handling of instruments, tools, equipment and machines by individual students or in small groups

D. Examinations

Theory: (35%) Two written examinations (half-yearly and final)

Practical: (65%) Practical Skill (performance) Test and Oral (Viva Voce) Exam

V. Measures of Program Effectiveness or Evaluation

- A. With an initial intake of 30 students, it is anticipated that 25 students will complete the full three year program and get their competency certificates. All or some of the remaining 5 students may be accepted to go onto the University or Institute. The first class of 25 trained refrigeration and air conditioning technicians should be available for employment in late 1981 or early 1982.
- B. Since this will be the first class of systematically trained technicians in this field with the emphasis on acquiring practical skills in repair and maintenance, all of them will certainly be employed whether in the state owned factories and enterprises (such as those listed earlier in III, Objectives and Need for Program), in the cooperatives, or in their own private repair shops. So, the job placement rate for the graduates should be 100%.
- C. Faculty and curriculum evaluation will be based on the number of graduates from this program who can competently do their jobs in refrigeration and air conditioning field. This can be found by:
 - a) asking their superiors and fellow workers
 - b) asking the customers who come to the repair shops
 - c) asking the graduates themselves on whether they have technical problems in their jobs that they cannot cope with and also asking their opinion on what should be done to improve the program.

VI. Resource Requirements

A. Staff Required - A total of 8 teaching staff will be required.

As shown below, two of them will be assistant lecturers, five of them will be instructors, and one of them will be a training coordinator.

<u>Staff Required</u>	<u>Duties & Responsibilities</u>
1 Asst. Lecturer (Mechanical)	To lecture RAC 201; RAC 203 To demonstrate RAC 203 Lab To act as Head of Department
1 Asst. Lecturer (Electrical)	To lecture RAC 202 To demonstrate RAC 202 Lab
2 Instructors (Mechanical)	To demonstrate RAC 201 Lab & RAC 203 Lab, and OJT Coordinator
1 Instructor (Electrical)	To demonstrate RAC 202 Lab
1 Instructor (Welding)	To lecture RAC 204 and demonstrate RAC 204 Lab
1 Instructor (Sheet Metal)	To lecture RAC 205 and demonstrate RAC 205 Lab
1 Training Coordinator	To coordinate & supervise OJT programs

Work Load of Teaching Staff:

	<u>Lecture</u> (hrs./wk.)	<u>Lab</u> (hrs./wk.)	<u>Total</u> hrs./ wk.	<u>Remarks</u>
Asst. Lecturer (Mechanical)	4 RAC 201 = 2 RAC 203 = 2	3 RAC 203 = 3 hrs. x 1 sec.	7	Plus, Head of Department duties
Asst. Lecturer (Electrical)	2 RAC 202 = 2	6 RAC 202 = 6 hrs. x 1 sec.	8	

	Lecture (hrs./wk.)	Lab (hrs./wk.)	Total hrs./ wk.	Remarks
Instructor I (Mechanical)	-	9 RAC 201 = 6 hrs. x 1 sec.	9	
		RAC 203 = 3 hrs. x 1 sec.		
Instructor II (Mechanical)	-	9 RAC 201 = 6 hrs. x 1 sec.	9	
		RAC 202 = 3 hrs. x 1 sec.		
Instructor (Electrical)	-	12 RAC 202 = 6 hrs. x 2 secs	12	
Instructor (Welding)	1	6 RAC 204 = 2 hrs. x 3 secs	7	
Instructor (Sheet Metal)	1	6 RAC 205 = 2 hrs. x 3 secs.	7	
Training Coordinator	-	-	44*	*To coordinate OJT programs and supervise the trainees

Student/Staff Ratio:

Total No. of Students	30
Lecture Section	1 (30 students)
Lab Sections	3 (10 students in each)
Student/Staff Ratio	10:1 in laboratory 30:1 in lecture class

NOTE: No additional instructor will be required to teach BUS 201, since it will be a common course offered by the Business (Accounting) Department.

QUALIFICATIONS AND PAY SCALES OF TEACHING STAFF

<u>Post</u>	<u>Pay/Month</u>	<u>Minimum Qualifications Req'd.</u>
Asst. Lecturer (Mechanical) (1 No. reqd.)	K 450-25-700 (K=Kyat; K 7.40 = \$1)	BE (Mechanical) Industry or teaching experience will be helpful
Asst. Lecturer (Electrical) (1 No. reqd.)	K 450-25-700	BE (Electrical Power) Industry or teaching experience will be helpful
Instructor (Mechanical) (2 Nos. reqd.)	K 320-20-500	7th. standard passed with 7 years experience in refrigera- tion and air conditioning field in industry
Instructor (Electrical) (1 No. reqd.)	K 320-20-500	T.T.I. (Electrical Power) Diploma with 3 years experience or Technical Teacher's Certificate; or, 7th. standard passed with 7 years experience in electrical repair works
Instructor (Welding) (1 No. reqd.)	K 320-20-500	T.H.S. (Welding) passed with 5 years experience; or, 7th standard passed with 7 years experience as a welder
Instructor (Sheet Metal) (1 No. reqd.)	K 320-20-500	T.T.I. (Machine Tools) Diploma with 3 years experience or Technical Teacher's Certificate; or, 7th. standard passed with 7 years experience in sheet metal fabrication works
Training Coordinator (1 No. reqd.)	K 320-20-500	T.T.I. (Mechanical or Electrical Power) Diploma with 3 years experience

Non-teaching Staff Req'd.:

	<u>Required</u>	<u>Starting Pay Per Month</u>
1. Storekeeper	1 No.	K200/-
2. Lab Attendants	5 No.	K200/-
3. Clerk/Typist	1 No.	K200/-
4. Office Help	1 No.	K150/-

Total (starting) salary of all staff = K4370/-per month
 = K52,440/-per year

Funding - The total wages of teaching and non-teaching staff comes to about Kyats 52,440/- per year. It will have to be paid out of the State's (Rangoon Division's) budget, since the Hlaing Regional College is funded by the Rangoon Division.

B. Equipments Required

For RAC 204 Welding - Equipment and facilities in the welding shop of the Metal Working Technology Department can be arranged for part-time use by the Refrigeration and Air Conditioning Technology students and instructor.

For RAC 205 Duct Fabrication - Equipment and facilities in the Sheet Metal Shop of the Metal Working Technology Department can be arranged for part-time use by the Refrigeration and Air Conditioning students and instructor.

For RAC 201, RAC 202 and RAC 203 courses - Refrigeration and Air Conditioning Shops for the above courses will need the following equipments and tools:

EQUIPMENT LIST FOR RAC 201, 202, 203

<u>Description</u>	<u>Quantity</u>	<u>Total Cost</u>
<u>For RAC 201</u>		
1. Mechanical skills of Refrigeration Test Bench, Model* 9630 with 10 student manuals	1	\$1,450.00
2. Domestic Refrigeration Trainer, Model 9102 with Installation Kit & instructor's guide	1	750.00

<u>Description</u>	<u>Quantity</u>	<u>Total Cost</u>
3. Commercial Freezer-Electric Defrost, Model 9109 with installation kit & manual	1	1,200.00
4. B.G. Refrigeration Tool Kit, Model 8800	5	900.00
5. All purpose Tubing Tool Kit	10	300.00
6. Refrigerant Leak Gun, Model 14470	1	130.00
7. Propane Leak Detector	30	150.00
8. CM-11692 Compound Pressure Gauge	6	50.00
9. Trig-o-matic Brazing Outfit, Model 7030B	3	250.00
10. Freon-12 Refrigerant Cans, 15-lbs.	10	300.00
11. Manifold Bar with Color Coded Gages & Accessories	5	150.00
12. Pinch-off Tool, Model 105-FF	6	40.00
SUB-TOTAL		5,670.00

For RAC 203

1. Basic Refrigeration and Air Conditioning Training Unit, Model 9001, with 10 manuals	1	1,900.00
2. Light Commercial Air Conditioner, Model 9111 with Installation Kit and Manual	1	1,350.00
3. Room Air Conditioner, Model 9110 with Installation Kit and Manual	2	2,000.00
4. Light Commerical Force Convection Evaporator, Model 9104 with Installation Kit & Manual	1	950.00
5. Automobile Air Conditioner Training Unit, Model 9302, with student Manual & Instructor's Guide	1	2,100.00
6. Basic Auto Air Conditioner Tool Set, Model 10565	5	350.00
7. Air Conditioning Tool Set, Model AC 402A	3	450.00
SUB-TOTAL		9,100.00

<u>Description</u>	<u>Quantity</u>	<u>Total Cost</u>
<u>For RAC 202**</u>		
1. Self-Contained HERMETI-CHECK, model 2001	5	350.00
2. Single Phase Compressor Control Board, Model 9215 with student manuals	2	1,000.00
3. Thermal Compon-E-Check Refrigeration Electrical Component Analyzer, Model 3001	5	500.00
SUB-TOTAL		1,850.00

NOTE: *Above equipment and models are manufactured by:
BRODHEAD-GARRETT COMPANY
161 Commerce Circle
Sacramento, California 95815
U.S.A.

**For RAC 202, some facilities such as those in the motor armature rewinding section of Electrical Repairs and Maintenance Technology Department can be arranged for part-time use by students and instructor.

N.B.: Electrical Power Source on all equipment must be 230 volts, 50 cycles, single phase A.C.

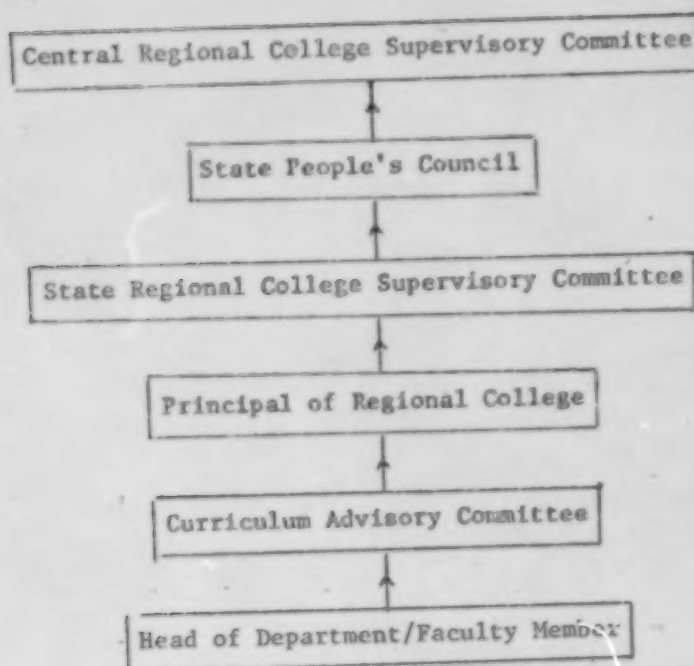
Funding - The total cost of equipment amounts to \$16,620. Since all this equipment has to be imported, the budget will involve foreign exchange, and therefore approval has to be obtained from the National Government, although the funding in Kyats will be done by the State (Rangoon Division)

- End of Proposal -

3.5 Approval Steps

The proposal of a new technology must start from the faculty or Department Head and the proposal has to be approved by the Curriculum Advisory Committee, Principal of Regional College, State Regional College Supervisory Committee, State People's Council and then finally by the Central Regional College Supervisory Committee. These steps for approval are shown in a chart below.

CHART FOR APPROVAL STEPS OF A NEW TECHNOLOGY



The State Regional College Supervisory Committee is entirely made up of the officials in that State or Division. It normally includes

1. a member of the Regional Party Committee (normally, President or secretary of the Party Social Affairs Sub-Committee) as chairman
2. a member of the State Regional People's Council as co-chairman
3. the principal of Regional College in that state as asst. secretary
4. State Education Officer as secretary
5. Rector or principal of the University or College in that State as member
6. Headmaster/Headmistress of a State school as member

The Central Regional College Supervisory Committee is composed of the following members:

1. Minister of Education as chairman
2. Deputy Minister of Education] as Vice-chairman
3. Deputy Minister of Health]
4. Deputy Ministers of various ministries, such as Transportation Ministry, Industry Ministry, Construction Ministry, Agriculture and Forest Ministry, etc., ... as members

IV. REVIEWING A PROGRAM OR TECHNOLOGY

4.1 Reasons for Needing a Program Review

In the community colleges in the United States, a formal review of a new program is done at the end of two years, and, for the existing programs, about every five years. Program reviews are needed regularly for the following reasons:

- i Manpower needs might change due to some changes in national economy. They might also be different from the projections made earlier at the start of the program. The review will help assess the present needs of the program and accurate future projections.
- ii Present curriculum might not be producing competent enough technicians and some changes in the curriculum should be considered.
- iii The faculty and staff might need to be reassessed on whether the faculty should be expanded or reduced, or whether the present staff is doing the job well and turning out good technicians or not.
- iv Facilities, equipment and space might need to be added and considerations for means of financing the necessary capital improvements need to be discussed.

4.2 Guidelines for Program Review

The following is a program review guide for a vocational education program. (The program review guide for a general education program is similar, and is given in the Appendix.) The same group of people are involved in program review as in development of a new program.

VOCATIONAL EDUCATION PROGRAM REVIEW GUIDE

I. Introductory Summary Statement

This is a brief recap of the more detailed information to follow. It should give the reader a general summary of major accomplishments and projected plans. It should also include plans for improvement.

II. Details and Analysis

- A. Objectives for the Period Preceding the Review
Do these relate to community colleges and/or system objectives?
- B. Need for the Program
 - 1. History of the program, initial need
 - 2. Present needs
 - a. Manpower projections
 - b. Employer requests
 - c. Advisory committee recommendations
 - 3. Student interest - Department of Education (DOE) surveys
- C. Target Groups
 - 1. Describe clientele served
 - 2. Enrollment of majors in the program - historical growth or decline
 - 3. Service to non-majors
 - 4. Special student groups served - veterans, handicapped - (Vocational Education State Director's Information)
 - 5. Others served - Federal programs, contract courses, etc.
- D. Program Elements
 - 1. Admission requirements, screening and placement
 - 2. Principal methods of instruction, evaluation
 - 3. Required and recommended courses; course descriptions
 - 4. Graduation requirements - certificates and degrees
 - 5. Outcomes - graduates, course completion rates, awards, results of licensing or certification (if any), follow-up studies and employment/educational activities of graduates and non-completers
- E. Curriculum Changes Projected
 - 1. Changes in offerings, methods or approaches, rationale
 - 2. Changes in graduation requirements projected

- F. Articulation with Private and Public High Schools and Post Community College Agencies
- G. Personnel Resources
 - 1. Present staffing plan - faculty characteristics; workloads
 - 2. Projected staffing plan - rationale
 - 3. Major activities of staff - including curriculum development, community service activities
 - 4. Staff development activities
- H. Financial requirements (non-capital improvement)
 - 1. Data should include historical material, and all sources
 - a. Personnel
 - b. Supplies/other expenses
 - c. Equipment
 - 2. Impact on support services
 - a. Institutional support
 - b. Building operations/maintenance
 - c. Student services, admissions, records and counseling, job placement, financial aids, student activities
 - d. Library, learning centers
 - 3. Student costs - unit cost study, contracts and grants reports
- I. Capital improvements
 - 1. Additional space or facilities needed, rationale
 - 2. Alteration needed, rationale
- J. Major Strengths of the Program
- K. Major Weaknesses
- L. Plans for Improvement
- M. Comments by Faculty
- N. Comments by College Administrators

4.3 Example of a Program Review

As an illustration, an authentic draft of a program review of a new program at the end of the second year is given in the Appendix A-3. It is

for the Occupational Safety and Health Program at Honolulu Community College.

4.4 Guidelines for New Course Proposals

Should a new course need be introduced, the following guidelines and format are used for a new course proposal at community colleges

GUIDELINES FOR NEW COURSE PROPOSAL

I. Course Identification

A. Identification:

Course Title
Course Alpha, number, units (credits)
Lecture hours, lab hours other
Total hours

B. Course description as it will appear in the catalog

C. Proposed first offering, date, place and department, proposed section size (students, number)

D. Name of person submitting proposal, his title, and his department

E. Approvals to be signed by:

Department chairman, Date
Committee on Programs & Curricula, Date
Dean of Instruction, Date
Provost, Date

II. Justification

A. General Course Objectives

What knowledge and/or skills will successful completion of this course develop in the student?

- a. General
- b. Specific

B. Target groups

For what specific groups of students, or potential students, has this course been designed?

C. Client groups

What specific group organizations or institutions in the university and in the community will receive the benefits of the knowledge and/or skills developed by this course?

D. Measures of Effectiveness

Indicate evaluation procedures which will be employed to determine if the course objectives are being met

E. Relationship to other courses

Indicate if this course will replace an existing course or courses, if it requires a prerequisite, if it is a preparatory course for more advanced work, etc.

III. Resources Required

A. Staffing implications:

Will additional staffing be required to offer this course?
What instructional skills and background are acquired?

B. Facilities and equipment implications:

What facilities will be required for the course?
What equipments will be required?
Are additional facilities and equipment beyond those now available required?

C. Course development background

What led to the development of this course?
How was the need determined?
Were surveys and/or studies undertaken?

IV. Articulation

A. Are there comparable courses in the system?

Will this course transfer to other institutions?
What other institutions have agreed to accept this course for credit for specific major and/or degree requirements?

B. Educational Development Plan

Has this course been included in the Discipline Educational Development Plan.

V. Course Outline

Attach course outline, using the following format:

Name of Community College

Course Outline

Course Title:

Department & Course No.

1. Course Description

2. Semester Units

3. Hours per week:

Lecture,

Lab,

Total

4. Prerequisite:

5. Course Objectives:
 - a. General
 - b. Specific
6. Course Content
7. Text and References
8. Equipments and Materials
9. Methods of Instruction
10. Methods of Evaluation

4.5 Example of a New Course Proposal

As an illustration, an authentic draft of a proposal of a new course, "Techniques of Industrial Hygiene", is given in the Appendix. This course is proposed to be offered by the Department of Occupational Safety and Health at Honolulu Community College, Honolulu, Hawaii.

4.6 Guidelines for Program Review for Burmese Regional Colleges

The programs at the Burmese Regional Colleges should be reviewed regularly every two or three years by the respective Curriculum Advisory Committees. The findings and recommendations for any changes to be made should be reported to the Central Regional Colleges' Supervisory Committee through the principal of the Regional Colleges, and through the State Regional College Supervisory Committee.

GUIDE FOR PROGRAM REVIEW

I. Introductory Summary Statement

This is a brief summary of the more detailed information to follow. It should give the reader a general outline of major accomplishments and projected plans. It should also include plans for improvements.

II. Details and Analysis

A. Objectives for the period preceding the review

- B. Need for the program
 - 1. Background, history of the program, initial need
 - 2. Present needs - manpower projections, employer requests
 - 3. Student interest - enrollment of majors in the program, historical growth or decline
 - 4. Service to non-majors and others
- C. Program elements
 - 1. Admission requirements, screening and placement
 - 2. Principal methods of instruction, evaluation
 - 3. Required and recommended courses, course descriptions
 - 4. Graduation requirements - Diploma and Competency Certificate
 - 5. Outcomes - number of graduates, course completion rates, follow-up studies and employment/educational activities of graduates and non-completers
- D. Personnel resources
 - 1. Present staffing plan - faculty characteristics, work loads
 - 2. Projected staffing plan
- E. Financial requirements (non-capital improvement)
 - 1. Financial data (budget) should include:
 - a. Wages of staff and personnel
 - b. Supplies and other current expenses
- F. Capital improvements
 - 1. Additional equipment, facilities or space needed
 - 2. Alterations needed
- G. Major Strengths of the Program
- H. Major Weaknesses
- I. Plans for improvements
- J. Remarks by the Principal
- K. Remarks by the State Regional College
- L. Other Remarks

4.7 Guidelines for a New Course Proposal for Burmese Regional Colleges

If a new course is considered to be introduced in a Regional College in Burma, the following format and guidelines can be used in making the proposal of the new course to the authorities concerned.

GUIDELINES FOR NEW COURSE PROPOSAL

I. Course Identification

A. Identification

1. Course Title
2. Course Number
3. Hours per week: Lecture, Tutorial, Lab

B. Course description as it will appear in the catalog

C. Proposed first offering, date, college and department

D. Proposed section size, theory and lab

E. Name of person submitting proposal, his title, his department

F. Approvals to be signed by:

1. Department Chairman, Date
2. Curriculum Advisory Committee, Date
3. Principal of Regional College, Date
4. State Regional College Supervisory Committee, Date
5. Central Regional College Supervisory Committee, Date

II. Justification

A. General course objectives

What knowledge and/or skills will successful completion of this course develop in the student?

1. General
2. Specific

B. Target groups

For what specific groups of students, or potential students, has this course been designed?

C. Client groups

What specific group organizations or departments in the University or institutes and in the community will receive the benefits of the knowledge and skills developed by this course?

D. Measures of Effectiveness

State evaluation procedures which will be employed to determine if the course objectives are being met.

E. Relationship to other courses

Indicate if this course will replace an existing course or courses, if it requires a prerequisite, if it is a preparatory course for more advanced work, etc.

III. Resources Required

A. Staffing Implications

Will additional staffing be required to offer this course?
What instructional skills and background are required?

B. Facilities and Equipment Implications

What facilities will be required for the course?
What equipments will be required?
Are additional facilities and equipment beyond those now available required?

C. Course Development Background

What led to the development of this course?
How was the need determined?
Were surveys and/or studies undertaken?

IV. Course Outline

Attach course outline to the proposal, using the following format:
(A detailed illustration has been given in sec. 3.3, step 5)

Name of Regional College

Name of Region

Course Outline

Course Title:

Course Number:

Hours per week:

Lecture

Tutorial

Lab

Major:

Year:

Department:

- A. Course Description
- B. Course Objectives
 - 1. General
 - 2. Specific
- C. Course Content
- D. Text and References
 - 1. Text
 - 2. Reference
 - 3. Handouts
- E. Equipments and Materials
- F. Methods of Instruction
- G. Methods of Evaluation

V. CONCLUSION

This paper on the Curriculum Development in a Community/Regional College is a result of the author's three-month study on community colleges in the State of Hawaii, U.S.A., with the study program arranged by the College of Education, University of Hawaii, Honolulu, under the sponsorship of the Bureau of Cultural Affairs, Department of State, U.S. Government.

In this paper, attempts have been made to show how a community college in the United States develops a new course, a new curriculum or a new program and how this method is adapted for a trial development of a new technology in a Regional College in Burma.

A detailed step-by-step procedure for developing a new technology is illustrated for the Refrigeration and Air conditioning Technology for a Burmese Regional College. It is also discussed in this paper of how the community colleges improve their programs through regular program advisory committees, the faculty and the administrators of the college, and how this method can be adapted for use in the Regional Colleges in Burma. Further information on the advisory committees is given in A-5 of the Appendix.

Finally, it is the sincere wish of the author that this paper would be of some help to the faculty and administrators of the Burmese Regional Colleges in developing a new curriculum or technology, or improving an old one.

DEFINITIONS

- articulation -The interrelation of the school's instructional program with educational programs of other available institutions or with work opportunity.
- community college -A college typically established to meet the educational needs of a particular community and offering 2-year training either terminal or preparatory, in professional and liberal arts fields
- credit hour -A unit used in measuring and recording the work completed by a student in an institution of higher education. (Normally, 1 credit hour represents 1 hour of theoretical instruction per week for a semester; or 1 credit hour represents 3 hours of laboratory practice or field work per week for a semester).
- curriculum -A general overall plan of the content, or specific materials of instruction, or a systematic group of courses, or sequences of subjects that the school should offer the student by way of qualifying him for graduation or certification, or for entrance into a profession or a vocation.
- curriculum development-A task of supervision directed toward designing or redesigning the guidelines for instruction; includes development of specifications indicating what is to be taught, by whom, when and where and in what sequence or pattern.
- job analysis -A detailed listing of duties, operations and skills necessary to perform a clearly defined specific job, or organized into a logical sequence which may be used for teaching, employment or classification purposes.
- refrigeration/air conditioning mechanic -The refrigeration and air conditioning mechanic installs, maintains and repairs equipment and necessary units for conditioning air and cooling water on customers' premises.
- semester -Half of an academic year, usually 16 to 18 weeks.
- task analysis -Reduction of the components of a task to its basic behavioral elements, usually for purposes of determining the best methods of training to perform it, but also to better understand the learning process.

APPENDICES

APPENDIX A-1
Certificate of Achievement Program for Marine
Pipefitter Pearl Harbor Naval Shipyard

I. Background

Formal discussions at Honolulu Community College to meet immediate and long-term manpower and training needs for the classification of "Limited Mechanics" in all trades at Pearl Harbor Naval Shipyard (PHNSY) began on May 4, 1976. (See Attachment A). The Chancellor for Community Colleges and his staff participated in the first two planning discussion sessions. Representatives from the Hawaii State Department of Planning and Economic Development (DPED) and the PHNSY collaborated in all discussions leading to recommendation for decision-making by the University. Additionally, ad hoc meetings were held with technical staff from PHNSY and the Civil Service Commission to develop detailed curriculum and training plans as well as staffing and budgetary proposals for consideration by all agency representatives. (Attachments A-F)

The result of these planning meetings, over a ten-month period, is a proposal which seeks to meet manpower and training needs for Marine Pipefitters at PHNSY. At the present time, recruitment for pipefitters is conducted on the mainland. Dillingham Shipyard is the only local source of trained marine pipefitters. Fortunately, there exists at Honolulu Community College, an established program (RAC) which is closely related to the training proposed.

II. Introduction

Based on the background information provided, Honolulu Community College plans to initiate a Certificate of Achievement Program in the Fall of 1977 to meet the immediate and projected manpower needs of "Limited Mechanics" at PHNSY for Marine Pipefitters.

The anticipated result of Fall 1977 implementation would be 25 trained "Limited Mechanics" in Marine Pipefitter by August 1978. The proposal and training will be evaluated for meeting long-term needs as well as for developing training curricula for other trade areas at PHNSY.

III. Objectives and Need for Program

- A. The objective of this program is to provide the necessary instruction and on-the-job training required to meet the "Limited Mechanics" qualifications as established by the United States Civil Service Commission for employment at PHNSY. Skills to be taught relate specifically to PHNSY needs and the training incorporates a cooperative Vocational Education component. This will drastically reduce the need for specific high cost equipment, which is presently available only at the Shipyard. Every student will be required to participate in "on-the-job" cooperative education to meet the requirements of the curriculum.
- B. The five-year manpower projection which was provided by PHNSY, is as follows:

	<u>Recruitment Schedule</u>						<u>Total</u>
	<u>On Board</u>	<u>1/77</u>	<u>1/78</u>	<u>1/79</u>	<u>1/80</u>	<u>1/81</u>	
Marine Pipefitter	425	60	60	100	100	100	420

This manpower projection is a recruitment schedule and does not take into account normal attrition such as retirement. The data provided were based upon an approved manpower ceiling for PHNSY to be 5,500 effective October 1977 and 6,128 by October 1978. Beyond this period the projected ceiling is 7,500. The present ceiling is 5,200.

A similar program is not offered at any other college in the State of Hawaii. This program is being proposed for Honolulu Community College because courses required by the Refrigeration and Air Conditioning

program relate to and meet part of the training requirements for this Certificate of Achievement. The Trade Complex, scheduled to be completed in Fall 1977 at Honolulu Community College will provide the facilities and part of the equipment required for the proposal training program.

C. Target Group

Second year continuing Refrigeration and Air Conditioning majors will be able to fulfill the requirements of the Marine Pipefitting training program by August 1978. In addition, as a result of the high interest of students in Refrigeration and Air Conditioning, there are 41 students in the "standby" classification who should have already completed the first year curriculum required for Marine Pipefitter and could easily move into the second year curriculum. For those graduating this May, job opportunities may be further enhanced by completing the limited number of additional courses required by the Marine Pipefitter Curriculum.

One problem that will require further investigation is the security clearance required of all employees of PHNSY and the restriction that employment may be given to only U.S. citizens and those from American Samoa. This employment opportunity will be clarified in detail to all interested students and it will be pointed out that completion of the program does not guarantee permanent employment. The intent of this program is to qualify individuals under the criteria listed on the Federal register for "Limited Mechanics."

IV. Description of Program

- A. The curriculum for Marine pipefitter does not conform to the guidelines for program option as specified in the Community College Curriculum Handbook. However, the curriculum requires all of the related subjects required of our existing Refrigeration and Air Conditioning program with an additional 18 credits in the discipline.

<u>First Semester</u>		<u>Cert. of Achievement</u>
MATH 50	Elementary Technical Math I	3
WELD 17C	Arc Welding	1
ENG 55/22	Business Communication/Introductory Expository Writing	<u>3</u>
		7
<u>Second Semester</u>		
MATH 55	Elementary Technical Math II	3
WELD 17B	Gas Welding	1
PHYS 51	Solid and Fluid Mechanics	<u>4</u>
		8
<u>Third Semester (Fall 1977)</u>		
*Naval Blueprint Reading		2
*Pipe Drafting		3
*Marine Pipefitter I		<u>6</u>
		11
<u>Fourth Semester (Spring 1978)</u>		
*Marine Pipefitter 93V	Cooperative Education	<u>6</u> (3.3)
		6
<u>Summer 1978</u>		
*Marine Pipefitter 93V	Cooperative Education	<u>6</u> (3.3)
		6
Total		38 credits

*Additional courses required for this option. These are new courses and not currently offered by the college.

B. Course Descriptions:

MATH 50 Technical Math I (3)
 Prerequisite: MATH I or equivalent and enrollment in an
 occupational program
 Basic algebra and basic geometry as applied to shop problems
 (3 hrs. per week)

WELD 17C Arc Welding (1) for Non-Majors

Basic Arc welding. Safe operation of machines and equipment. Fundamentals of arc welding ferrous metals. Introduction to oxy-acetylene cutting. (3 hrs. lab)

ENG 55 Business Writing (Business English) (3)
Prerequisite: Required placement test score

A practical workshop in the elements and types of writing. Emphasis is placed on understanding the way sentences can be made to communicate the writer's ideas. (3 hrs. lect.)

ENG 22 Introduction to Expository Writing (3)
Prerequisite: Required placement test score

Intensive study of structure, usage, and vocabulary of English as a necessary prelude to effective writing. Emphasis is placed on the organization of sentences to communicate ideas in short papers. Students are encouraged to exercise critical thinking and clear, correct language in written communications. (3 hrs. lect.)

MATH 55 Technical Math II (3)
Prerequisite: MATH 50 or equivalent and enrollment in an occupational program

Basic numerical trigonometry and further applications of algebra and geometry to shop problems. (3 hrs. per week)

WELD 17B² Gas Welding (1) for non-majors

Basic oxy-acetylene welding. Introduction to the safe operation of oxy-acetylene equipment. Fundamentals of fusion welding of ferrous metals in various positions. Fundamentals in brazing and silver soldering of ferrous and non ferrous metals. Introduction to oxy-acetylene cutting. (3 hrs. lab.)

PHYS 51 Solid and Fluid Mechanics (4)
Prerequisite or Co-requisite: MATH 50 or equivalent

Introductory applied mechanics. Precision measurement; properties of materials; forces and torque; laws of motion; work, power, and energy; machines and power transmission; liquid and gas pressures; density, specific gravity, and buoyancy; Pascal's Law and hydraulic devices, heat effects and energy. (3 hrs. lect.; 3 hrs. lab.)

Naval Blueprint Reading (2)

This course provides the theoretical concepts utilized in Naval Blueprint, the use of training manuals and drawing plates relative to the trade through the problem solving process (1 hr. lect.; 3 hrs. lab.)

Pipe Drafting (3)

Use of naval training manual and drawing plates prepared by the National Joint Steamfitter Pipefitter Committee.

(2 hrs. lect.; 3 hrs. lab.)

Marine Pipefitter I (6)

This course provides instruction on ship's nomenclature pipefitting materials and terminologies, use of basic tools, pipe threading, joint assemblies bending and soft and hard soldering and understanding of the marine piping system.

Advanced instruction in pipe layout fabrication, installation, testing and maintenance of piping system. (4 hrs. lect.; 6 hrs. lab.)

Marine Pipefitter 93V Cooperative Education (1-4V)

Provides "on-the-job" supervised activities in area of specialization. (1 credit for every 75 hours)

C. Methods of Instruction

The maximum class size for each of the projected new courses will be 30 students with a minimum of 15 students. Instruction will be done by

- (i) Lecture and discussion in class
- (ii) Practical demonstration in laboratory or at shipyard.

D. Examinations

Written, oral and performance objectives will be utilized in all courses.

V. Measures of Program

- A. Due to the urgency in meeting the manpower needs projected by PHNSY, the intent is to advise and counsel continuing and standby students in Refrigeration and Air Conditioning to pursue the proposed program for the Fall semester 1977. The student target group would then be able to meet the "Limited Mechanics" qualifications by August of 1978 and qualify to apply for the Federal Civil Service examination in October of 1978. With an initial intake of 30 students, it is anticipated that 25 students will complete their program and be available for employment in October 1978, taking into account an attrition rate of five students.
- B. Based upon the recruitment schedule provided by PHNSY, the job placement rate of graduates should be 100%.
- C. Faculty and curriculum evaluation will be based on the number of graduates from this program who successfully qualify as "Limited Mechanics" by passing the examination administered by the United States Civil Service Commission.

VI. Resource Requirements

- A. All new courses will be staffed by lecturers. Due to the specialized nature of the courses, instructors (lecturers) will be recommended by the respective shop supervisor at Pearl Harbor Naval Shipyard and the College will evaluate each applicant on his or her teaching potential based on the minimum qualifications for voc/tech instructors as established for community colleges, i.e. minimum 7 years of experience as a journeyman in industry. Funds for the implementation of this program were not projected for the 1977-79 biennium. However, in coordination with the State Department of Planning and Economic Development, funding sources are being investigated. This new Certificate of Achievement was included in the State Plan for Vocational Education, for possible funding.
- B. The Construction Trade Complex at Honolulu Community College should provide the necessary facilities to meet the program needs. Equipment requirements are displayed on the budget sheet and sources of funding are being investigated, as is the case for funding of instructional costs.

BUDGET IN 1977-78Marine Pipefitter

Pipe Drafting	3 credits
Naval Blueprint Reading	2
Marine Pipefitting I and II	6
Cooperative Vocational Education	6
Cooperative Vocational Education	<u>6</u>
	23
23 credits at \$429 =	\$9,867
Workmen's Compensation, 1.84% x 9,867 =	<u>182</u>
Total	\$10,049

Equipment

Bending Machine	2,500
1" x 4' x 8' layout plate	<u>1,700</u>
	\$4,200

Supplies

Total cost for Marine Pipefitters	\$7,000
	\$21,249

PROGRAM REVIEW GUIDE FOR GENERAL EDUCATION AREAS*

Part I. Introductory Summary Statement

In no more than three pages provide an abstract of the total review, focusing on accomplishments of the previous five years and plans for the next six years. Include: specific objectives and need; role of the discipline in the curriculum of the campus; enrollments; annual operating costs; anticipated revenue sources; alternative plans if funding expectations are not realized; results of accreditation reviews; and any other major points made in Part II.

Part II. Details and AnalysisA. Objectives

1. Rationale for including this discipline in the curriculum. (E.g., Definition of discipline, why should community college students be exposed to this field, what are the broad learning or performance objectives of courses in this field?)
2. Relationship to degree and certificate programs: which ones require how many courses or credit hours in this discipline?
3. Historical development of discipline strength at this college.

B. Target Group

1. Enrollment data:
 - a) Number of SCH taken by AA, Voc, and Unclassified students for previous five years (see crossover reports: IRP 34, 51, 62, 74, 87; also computer reports 2524 B & C for applicable years).
 - b) Number and % of students and SCH in courses numbered below 100, 100-199, and 200+, for previous five years (see computer reports 3011, 2524 B and C).
2. Special student groups served: veterans, handicapped, economically disadvantaged, special community groups.
3. Origin of students: (Use data for college on geographical or high school background of students: SIER computer reports 2503, 2507, and 2510; MSO Report 145.)
4. Anticipated changes in numbers or types of students served or student credit hours offered in the next six years.
Rationale.

*Throughout this guide, underscoring indicates key words to be used in following the report.

C. Courses

1. Course list, including for each: course description, regular instructor (if appropriate), prerequisites, degree requirements which this course meets. Identify increases or decreases over past five years.
2. Articulation:
 - a) Identify courses which have been accepted by other UH colleges as meeting their core or distribution requirements. Indicate progress in past five years.
 - b) Identify majors at four year UH colleges for which full lower division preparation is available at your college. Indicate changes in past five years.
3. Principal methods of instruction: past, present, future plans.
4. Examinations--performance, written, oral. Projected changes.
5. Adequacy of curriculum: Are there adequate numbers and sections of courses at each level to meet the needs of vocational students? transfer students? other students? Include basis for evaluation. (See Computer Report 3011 for levels of courses.)
6. Proposed changes: What course additions, deletions, consolidations, or modifications are projected for the next six years? Provide rationale (or refer to appropriate previous section).

D. Measures of Effectiveness

1. Course completion rates for past five years. Discuss. (See IRP 42, 49, 63, 76, 88 and computer reports 2528 and 2529).
2. Number of students from your college majoring in related subjects at Manoa, Hilo and West Oahu (for past five years). (See computer reports 2540 and 1432A.)
3. Results of any relevant post-test proficiency measures used by college.
4. Relevant results of any accreditation reviews.
5. Faculty evaluation: types, results, future plans.
6. Student advising by faculty: results of any program; future plans.

E. Personnel Requirements

1. Current regular faculty: name, tenure status, position count, professional qualifications, publications. (Attach vita for each faculty member.) Indicate changes over past five years.
2. Lecturers and part-time instructors: number of positions, position counts. Percent of total positions and position counts. Changes over five years. (See IRP 16, 32, 45, 60, 72, 73, 84, 86.)
3. Shared or split appointments of faculty and staff with other programs, disciplines or activities. Projected changes?
4. Required qualifications of instructors and lecturers. Relationship to objectives.
5. Average instructor salary and average lecturer salary. (See IRP 27, 46, 61, 73, 86 and FSIS computer report 2532.)
6. Past experience and future plans for providing faculty with additional compensation besides regular compensation.
7. Tenuring plans for faculty: current and anticipated future percentages. (See IRP 27, 46, 61, 73, 86 and SIS computer report 2530. National figures in annual July issue of Chronicle of Higher Education.)
8. Current and proposed faculty work assignment guidelines: minimum and average class sizes; student/faculty ratios; minimum and average semester credit hours; minimum and average weekly instructional contact hours per faculty; levels of courses taught concurrently; average hours per week of other expected non-compensated activities: public service, research, etc. (See IRP 32, 45, 60, 72, 84.)
9. Past, present and future faculty development program and plans.
10. Other personnel: past and present positions and position counts of administrative and support personnel.
11. Proposed new positions, position counts, and costs for administrative, faculty, lecturer and support personnel over the next six years.

F. Financial requirements (non-CIP)

1. Past, present and future anticipated costs of:
 - a) personnel
 - b) supplies/other current expenses
 - c) equipment (list available equipment and required additions)

2. Impact on support services--estimate past, present and future costs:
 - a) institutional support
 - b) building operations/maintenance
 - c) computer services (other than those in a.)
 - d) student services: admissions, records, counseling, job placement, financial aids, student activities
 - e) library, learning centers
3. Student costs (use UH Instructional Unit Cost Study, Contract and Grants reports).

G. Capital Improvements (CIP)

1. Additions or alterations during previous five years.
2. Additional space or facilities needed; rationale, estimated costs, desired time schedule.
3. Alterations needed, rationale, estimated costs and desired time schedule.
4. Shared space and facilities.

H. Program Funding

1. Types, amounts and source, legal reference or authorization for each type of program funding (general, federal, special foundation).
2. Plans if non-state funding decreases.

I. Further Considerations

1. Special problems or expected developments.
2. Major strengths.
3. Major weaknesses.
4. Plans for improvement.

APPENDIX A-3 :

Review of the Occupational Safety And Health Program
at Honolulu Community College

PART II. DETAILS AND ANALYSIS

A. OBJECTIVES:

Objectives for the period preceding the review.

The Occupational Safety and Health Programs at Honolulu Community College has four major objectives:

1. To train and qualify personnel to function as paraprofessionals in the occupational fields within Occupational Safety and Health.
2. To provide a basic introduction to the concepts and requirements of Occupational Safety and Health for the College's vocational technical majors.
3. To upgrade the skills of personnel presently employed in Occupational Safety and Health.
4. To prepare personnel academically and technically for Baccalaureate and higher level programs.

The OSH program objective is construed as implementing the College-wide objective on an operational level. The College-wide objective is:

To develop eligible individuals to higher levels of intellectual, personal, social, and vocational competency by providing formal vocational and technical training and general academic instruction for certificates or

degrees short of, or in preparation for the baccalaureate; and by offering adult continuing education for both personal and vocational purposes.

Finally, the College-wide objective is a subset of the State of Hawaii objective for higher education which is:

To develop eligible individuals to the highest levels of intellectual, personal, social and vocational competency commensurate with their abilities and desires; to add to the sum of human knowledge by conducting basic and applied research; and enhance the welfare of the community by offering instruction and other services of benefit to the general public.

B. Need for Program

1. History of Program

Prior to the enactment of the Occupational Safety and Health Act of 1970 (Public Law 91-596), a shortage of professional Safety Specialists and Industrial Hygienists existed. Since December 29, 1970, these specific manpower shortages have intensified. It was evident that the manpower void could not be satisfied only by professionals

possessing the baccalaureate and advanced degrees and that professionals would function more efficiently with the assistance of paraprofessionals educated and trained to perform routine tasks in the recognition and evaluation of many occupational safety and health exposures.

In the past, the Hawaii Chapter of the American Society of Safety Engineers sponsored college-level safety training. These were isolated programs, however, and not based on any academic requirements. There have also been a variety of attempts at safety training in Hawaii, sponsored by different governmental agencies, with the primary purpose of motivating workers and supervisory personnel. Honolulu Community College, for example, has offered non-credit courses dealing with OSHA Standards for several years. The prime target groups have been journeymen and supervisory personnel from the construction industry. In the Spring of 1974, approximately 800 persons were served through 30 sections of 10-hour courses offered in the evening.

2. Present Needs

According to estimates of the Hawaii Chapter of the ASSE, there are 85 full-time occupational safety and health personnel. There are, however, 16,840 establishments in Hawaii having 395,150 work places. Obviously, there are not sufficient numbers of trained professionals or paraprofessionals available to adequately serve the objectives of the Occupational Safety and Health Act or the humanitarian and economic objectives of occupational safety and health.

Some of the tasks currently being performed by the professional and some of the job openings brought about by the Occupational Safety and Health Act need not be performed by a highly skilled professional. A person trained to the technician level can satisfactorily serve in many capacities. In addition, the OSH program also takes into account the need to establish the OSHA curriculum at the paraprofessional level in such a manner so that graduates may continue preparation at a professional level.

C. Target Groups

1. Description of Clientel Served

The primary target group is predominately male. from a College-wide standpoint, 80% of the students enrolled in vocational programs are male. The percent of males in the ADT program is even higher than the College-wide figure and amounts to about 96%.

The various target groups served by the OSH program can best be characterized by the career intentions of each group.

- I. Students who intend to make occupational safety and health a lifelong career. Some of these students will seek employment upon completion of the Certificate of Achievement or Associate in Science degree requirements, while others may continue their professional training at a four-year institution.
- II. Students enrolled as majors in any of the College's 21 occupational majors. The stringent standards established by OSHA and HOSHL make it essential that vocational majors be aware of the safety and health requirements for their intended vocations.

III. Students who are presently employed and have been designated by their employer as the "safety-man" for the sub-unit or organization. In such situations, the program will serve an upgrading function.

During the Fall 1975 semester, there were 56 declared OSH majors in the program. In addition, 58 students with other majors at the College enrolled in OSH courses.

In the Fall 1976 semester, the comparable figures were 107 declared majors and 76 students with other majors enrolled in OSH courses.

The typical OSH major during the Fall 1976 semester was a male freshman whose permanent home address was Honolulu, carrying 12 or more units and planning to work towards the Associate in Science degree.

Students with majors in OSH generated 525 student credit hours in Fall 1975 and 1207 SCH in Fall 1976. Two hundred ninety-four (56%) of the Fall 1975 and 714 (59%) of the Fall 1976 SCH's were generated in OSH courses, the remainder were generated in other, generally Liberal Arts courses.

In summary, the distribution of SCH generated in Fall 1975 and 1976 by OSM majors is shown below:

TABLE

	MAJOR	HUM	N.S.	SOCSC	OTHER
1975-Fall	294 (56%)	60 (11%)	86 (16%)	54 (10%)	31 (6%)
1976-Fall	714 (59%)	142 (12%)	237 (20%)	83 (7%)	31 (3%)

The following table was developed and shows the percent of continuing students majors over a two-year period:

TABLE I - Percent Of Continuing Student Majors By Semester Over A Two-Year Period

Year	Intake	Total Enrollment	No. Students Continuing	Percent (%) of Continuing Students
Fall 1975	52	56	4*	7
Spr 1976	24	62	38	61
Fall 1976	33	98	59	60
Spr 1977	13	94	81	86

*Started Summer 1975

Table I shows a nearly steady increase in the percent of continuing students.

3. Majors in the Program

TABLE II - Summary of Program Activity Over A Two-Year Period 1975-1977

Semester	Year	Courses	Classes		Semester Hours	Student Registrants	SCH	Enrollment	Average SCH in Major
			No. Sect.	Avg. Size					
Fall	1975	2	4	44	12	177	531	56	9.49
Spr	1976	4	8	36	24	291	873	62	14.08
Fall	1976	8	14	25	42	347	1041	98	10.53
Spr	1977	10	13	25	39	331	993	94	10.57

4. Service to Non-Majors

An important secondary target group for the OSH program is made up of students in the College's other occupational programs. These students will be affected by the standards imposed by OSHA and HOSL when they complete their training and become employed. The program offers introductory courses for these students to familiarize them with the requirements of State and Federal laws.

The following table illustrates the enrollment of non-majors into OSH courses over a two-year period. Students from 16 of the College's vocational programs are represented, as well as Liberal Arts and Unclassified students.

TABLE - Non OSH Majors Taking OSH Courses Over A Two-Year Period

<u>Semester</u>	<u>Year</u>	<u>Intake</u>	<u>Total Enrollment</u>	<u># Students Continuing</u>
Fall	1975	58	58	0
Spr	1976	57	72	15
Fall	1976	59	76	17
Spr	1977	43	66	23

D. Program Elements

1. Admission Requirements

Requirements for admission into the OSH program are the same as that for admission into the College; namely, "any high school graduate, or any person 18 years of age or over, is eligible for admission [to the Program]".

All students who declare a major must take a placement test in Mathematics and in English. OSH majors whose placement scores show a need for remediation can enroll in a major course concurrently with developmental courses, with the instructor's permission.

2. Principal Methods of Instruction and Evaluation

Lectures, seminars, individualized instruction, clinical experiences and use of guest lecturers.

Evaluation:

1. Student reports on classroom teaching.
2. Dean of Instruction evaluation.

3. Required and Recommended Courses

3. Review by OSH Advisory Committee.

OSH 101 Introduction to Occupational Safety and Health Part I (3)

An overview of the occupational safety and health and includes: History of the safety movement from primitive times to enactment of OSHA and other implementing legislation; Occupational safety and health as career; Occupational injuries and illness--scope of the Problem, cost factors and causal factors; techniques for control of hazards; occupational health; introduction to human factors of safety, the sociology of work, accident/incident investigation, concepts and techniques of inspections, surveys and audits; communications skills; instructional methods, materials and equipment; and the development of occupational safety and health organizations. (3 hrs. lect.)

OSH 102 Introduction to Occupational Safety and Health Part II (3)

Prerequisite: OSH 101 or consent of instructor

Continuation of OSH 101 and study of occupational safety and health organizations; job hazard analysis and pro-

cedures; techniques of inspections, surveys and audits; incident/accident investigation techniques; job redesign; protective clothing and equipment; importance scope of application of occupational safety and health codes and standards; clinical and field experience utilizing college and/or cooperating business facilities. (3 hrs. lect.)

OSH 103 Human Factors in Safety (3)

An introduction to the influence of the work environment on the worker. Subjects covered are: The biology of work; human error and accident causation; man-machine-environment interface; the behavioral sciences and occupational safety and health; mental hygiene and occupational stress; physical and environmental stress on man; and, application of human factors in occupational safety and health programs. (3 hrs. lect.)

OSH 104 Motor Fleet Safety (3)

Course will emphasize motor fleet operations as an integral part of the overall occupational safety and health program, with emphasis on driver selection and training to include psycho-physical and skill testing;

vehicle operator control; the Hawaii traffic laws and environment; vehicle accident investigation; transportation of dangerous materials and oversize cargo, and, integration of the fleet safety program into the occupational safety and health program. (3 hrs. lect.)

• OSH 105 Introduction to Industrial Hygiene (3)

This course will acquaint students with elementary aspects in the recognition, evaluation and control of hazards related to air contaminants, skin irritants, noise, temperature extremes, illumination and radiation. Emphasize occupational safety and health program, codes and standards; and training techniques. (3 hrs. lect.)

• OSH 205 Physical Hazards Control Part I (3)

Prerequisite: OSH 101, 102 or approval of instructor

Scope and application of systems safety; application of human reliability and error; application of occupational safety and health requirements in purchasing and contracting, plant and job layout; principles and application of guarding; principles and application of electrical and electronics safety; principles and application of manual and mechanical equipment, elevators, chemical safety; high pressure and compressed gas system; hand and portable

power tools; shop production, tools and equipment; introduction to construction safety; special industry hazards unique to the Hawaiian industrial environment; and, clinical and field experience utilizing facilities of the College and cooperating business facilities. (3 hrs. lect.)

OSH 206 Physical Hazards Control Part II (3)

Prerequisite: OSH 205

(3 hrs. lect.)

OSH 207 Industrial Fire Prevention and Protection (3)

This course is an introduction to fire cause, building construction, industrial processes, flammability of construction and industrial materials, integration of fire prevention and protection requirements into the occupational safety and health program. This course will be coordinated with the College's Department of Fire Science. (3 hrs. lect.)

OSH 208 Techniques of Industrial Hygiene (3)

Course will concentrate on exploration of basic categories of field instruments for detection of toxic substances and contaminants, with an explanation of underlying theoretical principles. Concentration will be on practical use

in the field. Emphasis will be given to the relationships and responsibilities of the paraprofessional and professional industrial hygienist. (3 hrs. lect.)

OSH 209 Occupational Safety and Health Standards
and Regulations (3)

Prerequisite: OSH 101, 102 or approval of instructor
This course will be a review of the importance, scope, application, and interpretation of codes and standards in terms of practical application. Emphasis on the implementation of OSHA by the State of Hawaii. Clinical and field experience utilizing the facilities of the College and cooperating business/industrial organization. (3 hrs. lect.)

OSH 210 Safety Program Management (3)

Prerequisite: OSH 101, 102 or approval of instructor
Course will acquaint the student with the fundamentals of management and their application to safety program development and organization. Emphasis will be given to the concepts of responsibility, accountability and authority as applied to occupational safety and health. (3 hrs. lect.)

4. Graduation Requirements--
Certificates and Degrees

REQUIREMENTS FOR THE ASSOCIATE IN SCIENCE DEGREE

1. Program Requirements
 - a. Major courses--33 credits in Occupational Safety and Health.
 - b. Each student shall successfully complete 15 credit hours from the Arts and Sciences or special courses sections of the College catalog. The objective of this requirement is to develop in the student college level capabilities in communications, quantitative reasoning, and social and cultural understanding. (Math 3, 23; Reading 001, 101; ELIP 5, 10, 15 cannot be used to meet this requirement).
 - c. A total aggregate of at least 60 credit hours.
 - d. A minimum grade point average of 2.0 (C grade).
 - e. Residency Requirement: The last twelve (12) credits in the major must be earned at Honolulu Community College. Exceptions to that policy may be made by the major departments and the Dean of Instruction. Credits earned by examination may not be used to satisfy this requirement.

FIRST SEMESTER

OSH 101	Introduction to Occupational Safety and Health Part I
OSH 103	Human Factors in Safety
ENG 45 or higher	Introduction to Expository Writing
PSY 100	Survey of Psychology
CHEM 100	Chemistry and Man
CHEM 100L or higher	Chemistry and Man Laboratory

Certificate
of
Achievement
Credits

Associate
in Science
Degree
Credits

3	3
3	3
	3
	3
	3
<u>1</u>	<u>1</u>
6	16

SECOND SEMESTER

OSH 102	Introduction to Occupational Safety and Health, Part II
OSH 104	Motor Fleet Safety
OSH 105	Introduction to Industrial Hygiene
MATH 24 or higher	Elementary Algebra
PHYS 100	Survey of Physics
PHYS 100L or higher	Survey of Physics Laboratory

3	3
3	3
3	3
	3
	3
<u>1</u>	<u>1</u>
9	16

		Certificate of Achievement Credits	Associate in Science Degree Credits
THIRD SEMESTER			
OSH 205	Physical Hazards Control, Part I	3	3
OSH 207	Industrial Fire Prevention and Protection	3	3
OSH 208	Techniques of Industrial Hygiene		3
OSH 209	Occupational Safety and Health Standard Codes and Regulations	3	3
AMST 220	Ethnic Subcultures		
		9	15
FOURTH SEMESTER			
OSH 206	Physical Hazards Control, Part II	3	3
OSH 210	Safety Program Management		3
	Electives		
		6	7
Minimum Credits Required:			
		30	60

5. Outcomes

At the end of its second full year of operation, the OSH program graduated thirteen (13) students in May, 1977.

As of this writing, nine (9) students have been employed as safety professionals or upgraded by various insurance underwriting firms in the state.

E. Curriculum Changes Projected

1. Changes in Offerings

As a result of two years experience with the OSH program, it was determined that there was some redundancy in the course offerings: specifically OSH 209 - Occupational Safety and Health Standards and Regulations is fully covered, except for the history of standards development, in OSH course 205 and 206 - Physical Hazards Control, Parts I and II and can be incorporated into the latter courses.

As a result of comments received during student interviews, it is apparent that there is a need for a course offering practical or work experience in applying the knowledge gained. A new course is being developed OSH 211 - Occupational Safety and Health Internship will make available practical or work experience as follows:

- (1) Day Students - will work as safety inspectors and assistants to the various vocational-technical departments on the Honolulu Community College campus.
- (2) Night students with day employment--arrangements will be made with their employers to engage in

an approved safety project in their area of employment. This will be coordinated with the Department of Cooperative Arts and Sciences Education.

The State of Hawaii is essentially a small business and industry community. It would be facetious that many businesses will be to afford the hiring of more than one person to meet their occupational safety and health program requirements. Therefore, the Honolulu Community College OSH program, which is primarily concerned to qualify people as inspector/technicians working under professionals, must incorporate in all its OSH course offerings more training on program management and administration, to prepare the graduates for positions where they will be the sole safety person in an enterprise. This can be accomplished with a minimum of course changes by including case studies, individual and class, and term project papers. This will further be facilitated by the work experience of the instructor-coordinator and lecturers who represent approximately 120 years in the occupational safety and health fields and complemented

2. Graduation Requirements

Changes Projected

F. Articulation With DOE And Post-Community College Agencies

by guest lecturers.

The growing impact of OSH Act of 1970 on all vocations, trades and professions mandates that students studying for entry into any field of endeavor should have an orientation to the purpose, scope and requirements of law. In view of this, a study is now under way to develop and offer a one- or two-credit orientation course on OSHA for all voc/tech students.

Current graduation requirements for either a Certificate of Completion or an Associate in Science Degree are proper and adequate, except as noted below.

Articulation has been underway with West Oahu College, UHM College of Education, UHM School of Public Health, Chaminade College of Honolulu and the University of Western Pacific, and Cogswell College (San Francisco). The increasing trend for professional credibility and recognition of occupational safety and health practitioners is evidenced by professional registration in some states, i. e., California, Texas, New York and certification programs by the Board of Certified Safety Professionals and

the American Association of Industrial Hygiene. This trend has established a need for further academic education for the occupational safety and health practitioner leading to a baccalaureate or master's degree. The articulation with the above mentioned institutions indicate that by the end of 1977, baccalaureate programs will be established in the State of Hawaii which will accept the OSH courses offered by HCC. It will be imperative, however, that academic courses taken at HCC will meet the professional core requirements of these baccalaureate programs. Therefore, dependent upon a student's career objective; i. e., safety program administration (management, business); safety paraprofessional/technician (inspector); safety engineer (education); industrial hygiene (public health), there will be a change required in the current academic requirements for an A. S. degree.

G. Personnel Resources

1. Present Staffing Plans

A. Faculty Characteristics

There is a single full-time faculty member assigned to the program. He is a nationally recognized safety professional, with over thirty-five years experience in

E. Workload

the field. Other personnel involved with the program are lecturers and at the present time, these are recruited from the group of practicing safety professionals in government, industry and insurance corporations.

During the first year, the full-time faculty member's teaching load was 12 credit hours per semester. During the second year, this was increased to the normal 15 credit hours expected of all full-time faculty at the College. Due to the critical shortage of professionals in the field of Occupational Safety in the State, it was necessary to schedule lecturers for from six (6) to nine (9) credits each semester in order to provide the necessary sequence of courses for major students.

The single full-time faculty member, working with the lecturers, spent the first year developing the full OSH Program and, during the second year, revised the course outlines and program sequencing to better serve the needs of industry. In addition, he has developed a proposal for a campus-wide program of inservice training for faculty and staff and acted as campus safety officer.

2. Projected Staffing Plan

Projected plans are to add one additional full-time instructor. Inasmuch as the lecturers, who teach the bulk of the OSH subjects are fully employed, they are not available to teach day classes. Therefore, there is a limitation on day class offerings. The addition of another instructor would essentially assume the doubling of day class offerings.

3. Major Activities of Staff

The rapid changes in the occupational safety and health field necessitate changes in course materials and offerings; and changes in curriculum as previously indicated. These continuing changes are accomplished by the incumbent instructor-coordinator. Additionally, he works in close coordination with other departments to assume that necessary courses are available and offered to meet the needs of the OSH students, particularly in the evening sessions. He also must be available to assist and support the lecturers who cannot spend any day hours on the campus. This includes student counseling and assistance.

Community Services: The incumbent instructor-coordinator is a locally, nationally and internationally known

authority on occupational safety program management and administration. Consequently, he frequently is requested to lecture, teach seminars locally, on the mainland and overseas. These activities are the subject of continuing letters of complement and thanks. He also makes available his expertise as a no-fee consultant on request.

4. Staff Development Activities

Until very recently, occupational safety and health was not an academic discipline. Consequently, the only opportunities for staff or professional development is for attendance and participation at professional meetings, national and international. This is absolutely imperative in order that the students be afforded the most current information on laws, regulations, procedures, etc. Further, in order that the lecturers are afforded the latest information, the instructor coordinator holds informal workshops (in his home) to update them

H. Financial Requirements (Non-CIP)

1. Direct Costs

2. Academic Support

3. Institutional Support

4. Student Costs

I. Capital Improvement (CIP)

J. Major Strengths of the Program

Financial data were derived following the model of the UH Instructional Unit Cost Study for the year ended June 30, 1974.

Budget categories included are A (Personnel), B (Supplies) and C (Equipment). For the academic year 1976-77, these costs totaled \$29,163.00.

Supportive costs in this area include the Dean's Office, Library, and Instructional Resource Center and amounted to \$10,211.00.

Included are Student Service, Administrators (Campus, System and UH Offices) and operations and maintenance costs all of which amounted to \$29,249.00.

The total cost per SCH amounted to \$33.74, or a total of \$68,623.00 for the academic year 1976-77.

None.

The community and student interest in the OSH program as evidenced by the increasing registration in the OSH courses, only limited by availability of course offerings.

K. Major Weaknesses

L. Plans for Improvement

- . The support of involvement in the program by the local occupational safety and health of fraternity.
- . The continuing recognition of the program by the business and industrial community as indicated by requests for nomination of names for jobs, i.e., Servco-Pacific, Fireman's Insurance Fund.
- . The expertise and practical experience of the OSH instructor/lecturer staff.
- . The availability for on-campus clinical experience.
- . The support of Honolulu Community College administration, staff and faculty.
- . Limited full-time faculty.
- . Lack of equipment funds to procure technical equipment.
- . Non-availability of upper-level academic progression for Honolulu Community College OSH graduates.
- . OSH program, currently, does not offer the student sufficient opportunity for practical work or experience.
- . Current planning includes the eventual hiring of an additional full-time instructor.

Proposed course and curriculum changes will make available work and practical experience for the OSH student.

Current articulation with post-community college institution indicate that by the end of 1977 there will be available baccalaureate opportunities for the Honolulu Community College OSH student.

M. Comments by Faculty

N. Comments by College Administrators

NEW COURSE PROPOSAL FORMAT

I. COURSE IDENTIFICATION :

A. IDENTIFICATION

Course Title: Techniques of Industrial Hygiene

Course Alpha OSH Number 208 Units 3

Lecture Hours 3 Lab Hours 0 Other 0

Total Hours 3

B. COURSE DESCRIPTION AS IT WILL APPEAR IN THE CATALOG:

Course will concentrate on exploration of basic categories of field instruments for detection of toxic substances and contaminants, with an explanation of underlying theoretical principles. Concentration will be on practical use in the field with clinical experience. Emphasis will be given to the relationships and responsibilities of the paraprofessional and professional industrial hygienist.

C. PROPOSED FIRST OFFERING: Spring 1977

Proposed section size: 30

D. PROPOSED BY: Dr. Julius Morris

E. APPROVALS:

Department Chairman

DATE

Committee on Programs & Curricula

DATE

Dean of Instruction

DATE

Provost

DATE

NOTE: The fully approved original copy of each proposal with the course outline must be filed in the master course outline file in the Dean of Instruction's office by the department chairman who signs the proposal.

II. JUSTIFICATION :

A E. GENERAL COURSE OBJECTIVES (What knowledge and/or skills will successful completion of this course develop in the student?)

A. General

To develop ability to select and use appropriate field equipment for monitoring toxic environmental exposures under professional guidance.

B. Specific

1) Understand principles of industrial hygiene surveys, sampling & instrument calibration.

B G. TARGET GROUP(S) (For what specific group(s) of students, or potential students, has this course been designed?)

Course has been designed to meet the educational needs either entering the field of occupational safety & health or one already employed in the field and require specific skills & practical experience in the use of industrial hygiene testing & measuring instruments.

C H. CLIENT GROUP(S) (What specific group organizations or institutions in the university and in the community will receive the benefits of the knowledge and/or skills developed by this course?)

Any employer requiring the services of a safety specialist, either full or part-time will benefit from a person who can effectively select & use the proper industrial hygiene detection and measuring instruments.

D I. MEASURES OF EFFECTIVENESS (Indicate evaluation procedures which will be employed to determine of the course objectives are being met.)

1. Periodic quizzes
2. Midterm exam
3. Final exam

~~III. COURSE EVALUATION:~~

E J. RELATIONSHIP TO OTHER COURSES (Indicate if this course will replace an existing course or courses, if it requires a prerequisite, if it is a preparatory course for more advanced work, etc.)

This course does not replace and/or duplicate any course at Honolulu Community College. Prerequisite for this course is OSH 105 and is not a prerequisite for any other course.

III. RESOURCES REQUIRED:

A K. STAFFING IMPLICATIONS (Will additional staffing be required to offer this course? What instructional skills and background is required?)

Will require a lecturer with previous training and experience in the selection and use of industrial hygiene field instrumentation.

A. GENERAL COURSE OBJECTIVES (cont "d)

2. Be able to select and use instruments for evaluating suspected toxic exposures.

Present facilities are adequate. Will require specific types of industrial hygiene sampling and measuring instruments. Until such instruments can be purchased, they will and can be borrowed from government agencies, businesses and vendors.

Training in selection and use of industrial hygiene instruments is an integral part of the training of all OSH and DOSH compliance officers.

A 2. ARTICULATION (Are there comparable courses in the U. H. System? Will this course transfer to other institutions? What other institutions have agreed to accept this course for credit for specific major and/or degree requirements?)

B g. EDUCATIONAL DEVELOPMENT PLAN (Has this course been included in the discipline Educational Development Plan?)

Honolulu Community College
October 1975

UNIVERSITY OF HAWAII: HONOLULU COMMUNITY COLLEGE

Course Outline

Techniques of Industrial Hygiene
Course Title

OSH 208
Department and Course Number

I. COURSE DESCRIPTION:

Course will concentrate on exploration of basic categories of field instruments for detection of toxic substances and contaminants, with an explanation underlying theoretical principles. Concentration will be on practical use in the field with clinical experience. Emphasis will be given to the relationships and responsibilities of the paraprofessional and professional industrial hygienist.

II. SEMESTER UNITS:

3

III. HOURS PER WEEK:

3

(LECTURE)

0

(LAB)

3

(TOTAL)

IV. PREREQUISITE: OSH 105

V. COURSE OBJECTIVES:

A. General

To develop ability to select and use appropriate field equipment for monitoring toxic environmental exposures under professional guidance.

B. Specific

1. Understand principles of industrial hygiene surveys, sampling and instrument calibration.
2. Be able to select and use instruments for evaluating suspected toxic exposures.

VI. COURSE CONTENT:

AIR CONTAMINANTS-GAS AND VAPORS-PARTICULATES - A review of the definition of terms and the collection properties of materials.

SAMPLING CONSIDERATIONS - The concept of representative sampling and sampling efficiency are studied. The effect of the nature of contaminant on sampling is examined.

IV. COURSE CONTENT (cont'd)

CALIBRATION OF INSTRUMENTS - Specific calibration techniques are examined for: air flow metering devices, grab samplers, concentrating instruments and direct reading instruments.

CALIBRATION OF INSTRUMENTS - Volume calibration using a wet gas meter and flow rate calibrator using a manometer.

AIR SAMPLERS - A review of the following instruments: hand pump, piston pump, ejector, fans vane pumps, diaphragm pump.

INERTIAL COLLECTORS - The theoretical principles are studied. The operation of impingers and cyclone collectors are studied in detail. Basic concepts of dust counting are covered.

AIR SAMPLERS, INERTIAL COLLECTORS - Samples are collected using impingers. Dust samples are counted.

DIRECT READING COLORIMETRIC INDICATORS - The theory and use of liquid reagents, chemically treated papers and indicating tubes is studied. The collection of samples for future laboratory analysis is covered.

DIRECT READING INDICATOR TUBES - The use and limitations of indicator tubes is examined. Various instruments and indicators are reviewed.

DIRECT READING COLORIMETRIC INDICATORS AND INDICATOR TUBES (LABORATORY) - Air pump calibration is conducted. A variety of colorimetric indicators and indicator tubes are used on unknown materials.

DIRECT READING PHYSICAL INSTRUMENTATION - The theory of operation is studied. The general consideration of use calibration, interferences, sensitivity and specificity is covered.

DIRECT READING PHYSICAL INSTRUMENTATION - The measurement of unknown concentrations of ozone, oxygen and combustible gas using the appropriate instrument.

DIRECT READING PHYSICAL INSTRUMENTATION - The measurement of unknown concentrations of carbon monoxide, mercury, halides and hydrocarbon using the appropriate instruments.

VENTILATION SURVEY INSTRUMENTATION - A study of the principles and instrumentation used in ventilation.

VENTILATION SURVEY INSTRUMENTATION - The use of vane anemometer, thermo anemometer, velometers and smoke tubes in evaluating ventilation systems.

NOISE EVALUATION - The study of the proper techniques used in noise survey instrumentation.

NOISE EVALUATION - Practical noise surveys are accomplished.

VII. TEXT AND REFERENCES:

1. Text: United States Steel Corp.
"Environmental Health Monitoring Manual" - 1973
2. Reference: "Fundamentals of Industrial Hygiene" NSC - 1971
3. Handouts

VIII. EQUIPMENT AND MATERIALS:

A. Classroom

1. Slide, film strip and motion picture projector
2. Blackboard
3. Examples of Industrial hygiene testing instruments

B. Lab.

N/A

IX. METHODS OF INSTRUCTION:

1. Lecture and demonstration
2. Student use of instruments
3. Discussion

X. METHODS OF EVALUATION:

1. Periodic quizzes
2. Midterm exam
3. Final exam

8-18-76
Date

[Signature]
Submitted by

[Signature]
Approved by

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OCT 14 1977

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